THE GAS JOURNAL

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A Glance at the Contents

Safety Cut-Off Device.

An account is published of a new safety gas cut-off valve manufactured by John Wright & Co. [p. 672.]

Burning Coal-Coke Mixtures.

A correspondent suggests in our columns to-day that consideration be paid to the sale of coal-coke mixtures. [p. 661.]

Tar for Road Making.

Mr. W. E. Cone, Technical Adviser to the British Road Tar Association, discusses recent developments in the use of tar for road purposes. [p. 679.]

Gas Fire Design.

We are able to publish photographs of the Askania gas fire which combines radiant heating with convective heat. The radiant efficiency of this interesting appliance is also given. [p. 660.]

Assistant Manager Required.

The City of Leeds Gas Department are inviting applications for the position of Assistant Manager of their New Wortley Works. The commencing salary is £320 per annum. [p. 690.]

Intermittent Chambers at Southampton.

Last week a new installation of Woodall-Duckham intermittent vertical chambers, complete with coal and coke handling and waste-heat recovery plant, was officially opened at the works of the Southampton Gaslight and Coke Company. [p. 665.]

New Pipe Joint.

A tube joint designed to replace screwed joints is described. [p. 671.]

Distribution from Southend to Windsor—1870-1932.

We publish to-day the third instalment of Mr. Escreet's paper dealing with distribution at high and medium pressures in the area of supply of the Gas Light and Coke Company. [p. 668.]

Cambridge Gas Order.

At the Offices of the Board of Trade last Thursday Mr. J. F. Ronca held an inquiry into an application by the Cambridge University and Town Gaslight Company for a Special Order empowering them to acquire the gas portion of the Cottenham Gas and Water Company. [p. 683.]

Commercial Photometry.

Mr. C. C. Paterson, in a lecture at the inaugural meeting of a branch in Manchester of the Illuminating Engineering Society, refers to the fact that with photoelectric methods an accuracy of 1½ p.ct. is easily obtainable with commercial photometry—and with speed in working. [p. 678.]

Dry Gas Meters.

A paper by Mr. E. Butterworth, of Messrs. W. & B. Cowan, Ltd., is published on the "Design and Manufacture of Dry Gas Meters." This contribution was read at a joint meeting of the Manchester and District and Yorkshire Junior Gas Associations, following the inspection of the Victory Works, Stretford, of Messrs. Cowan. [p. 681.]

Forthcoming Engagements

March 18.—SOUTHERN ASSOCIATION.—General Meeting, Hotel Metropole, Northumberland Avenue, W.C., at 2.30 p.m.

March 18.—INSTITUTE OF FUEL.—Meeting of North-Western Section, Manchester. Paper by Mr. T. A. Tomlinson and Dr. M. Barash, on "Complete Gasification in Vertical Retorts."

March 18.—LONDON AND SOUTHERN DISTRICT JUNIOR ASSOCIATION.—Lecture by Dr. R. Lessing, "Coal Constitution and Blending."

March 21.—INSTITUTION OF GAS ENGINEERS.—Gasholder Sub-Committee, 11 a.m., 28, Grosvenor Gardens, S.W. 1.

March 23.—INSTITUTION OF GAS ENGINEERS.—Meters Committee, 10.30 a.m., 28, Grosvenor Gardens, S.W. 1.

March 23.—B.C.G.A.—Annual Meeting of Eastern District, Cambridge.

March 24.—SOUTHERN ASSOCIATION OF GAS ENGINEERS (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, S.W. 1, 2.30 p.m.

April 5.—INSTITUTION OF GAS ENGINEERS.—Joint Lighting Committee, 2.15 p.m., 28, Grosvenor Gardens, S.W. 1.

April 7.—MIDLAND JUNIOR ASSOCIATION.—Paper by Mr. W. E. Cone.

April 8.—NORTH BRITISH ASSOCIATION.—Spring Meeting, Edinburgh.

April 11.—INSTITUTION OF GAS ENGINEERS.—Finance Sub-Committee, 2 p.m.; Finance Committee, 2.30 p.m.; Executive Committee of the Council, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.; 28, Grosvenor Gardens, S.W. 1.

April 12.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board, 28, Grosvenor Gardens, S.W. 1.

April 12.—INSTITUTION OF GAS ENGINEERS.—Council, 10 a.m.; Joint Research Committee of the Institution and Leeds University, meeting, luncheon, and visit to Croydon Gas-Works; Education Committee, 4 p.m.; 28, Grosvenor Gardens, S.W. 1.

April 13.—INSTITUTION OF GAS ENGINEERS.—Liquor Effluents and Ammonia Sub-Committee, 10.30 a.m.; General Research Committee, 2.30 p.m.; 28, Grosvenor Gardens, S.W. 1.

April 16.—MIDLAND JUNIOR ASSOCIATION.—Paper by Mr. W. W. Smirles, B.Sc.

April 16.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Rotherham and President's Address.

April 23.—WESTERN JUNIOR ASSOCIATION.—Meeting at Trowbridge and President's Address.

EDITORIAL NOTES

Freedom of Housing Estate Tenants

OWING to the attitude of local authorities in various parts of the country who are interested in electricity schemes, a position has arisen by which the Gas Industry has been adversely affected, though more recently there has been some amelioration of this position of affairs. Conditions in Kettering resulted in the local Gas Company promoting a Bill in the present Session of Parliament, one of the clauses of which prohibits the Kettering Urban District Council from prescribing the particular form of lighting and heating to be used in their Council houses; and in the progress of this Bill a good deal of interest is being taken. It was down for second reading on Monday of this week, when its rejection was moved by a Labour Member from the Rhondda, on the ground that it was an attempt on the part of a private company to "lay themselves on a pitch" which had cost the ratepayers a considerable amount of money. This member went on to explain that the Urban District Council, who own the electricity works, passed a resolution that only electricity should be used in their own houses and sites. He urged that the Bill would impose a burden on the district, because a large amount of the ratepayers' money had been spent on the electricity works and Council housing.

It is difficult to follow the line of reasoning that because a local authority chooses to spend the ratepayers' money on electricity works, ratepayers, as tenants, should be compelled to use the commodity produced. As we remarked when referring to this matter a few weeks ago, it is one which primarily affects the freedom of the subject. The policy of erecting Council houses has been dictated by a large unsatisfied demand for working-class dwellings, and some Councils who own their electricity supply undertakings have taken advantage of this demand to impose a condition which they would have been hardly likely to regard as businesslike had the case been one of the landlords looking for tenants, rather than tenants competing for houses. A Council is right to lay down conditions of tenancy, but they should be conditions suggested by considerations of public health, &c., and not such as this one. The Gas Industry is out to secure fair play in this matter, both for the tenants and for itself; and we feel sure that Monday's debate in the House of Commons will do much to assist towards that end. We congratulate the Kettering Gas Company, and also the National Gas Council, who were mentioned in the debate and who have worked hard to secure justice for the Industry in this matter.

Surely it may be argued that the really important principle is that the tenant should have freedom of choice in a matter which affects him so closely as does the form of lighting and heating which shall be installed in his house. It seems to us, at any rate, that this principle demands consideration before the argument introduced in support of the rejection of the Bill—namely, that the Housing Estate of the Kettering Urban District Council has been purchased with the ratepayers' money, while the Gas Company stands for private enterprise. If restrictions of this kind are to be the result of the expenditure of ratepayers' money, then the ratepayers should prefer private enterprise every time. The House was told by the Hon. Member that the Kettering Urban District Council are not afraid of competition, but that, as far as their property is concerned (where they are going to provide all the modern amenities that are possible), they ask to be allowed to be "masters in their own house." Should it be too much to ask them, in turn, to accord the same privilege to their tenants?

As the debate proceeded, the strength of the position taken up in this matter by the Gas Industry became increasingly apparent, and the extent to which it was realized was evidenced by the fact that the Bill was read a second time without a division. Mr. Reginald G. Clarry, who is a Vice-President of the Gas Companies' Protection Association and whose assistance in Parliamentary matters it is the good fortune of the Gas Industry to enjoy once again, was able to contribute extremely useful points to the discussion, particularly in connection with his own Division of Newport (Mon.). He recalled the fact that prior to 1925 there had been a tendency to show discrimination against the Gas Company in Newport. In that year, the Corporation brought forward a Bill asking for further powers with regard to land, and in that Bill there were certain words which might have been held to give a statutory confirmation of what they had been doing in the past. The Gas Company asked to have the matter put right. A clause was subsequently inserted, and its existence proves the incorrectness of the argument that no precedent exists for the present Bill. It may be useful to quote here this clause, which is in the following terms: "The Corporation shall not make or impose under the powers of this section any term, condition, or restriction with respect to the form of light, heat, power, or energy to be used in any house, shop, office, warehouse, or other building or on any lands, or with respect to the taking by any particular local authority, company, body, or person of any form of light, heat, power, or energy."

A Summary

WE have chosen this title to call attention to the Presidential Address of Mr. E. B. Tomlinson, Engineer-in-Chief to the Birmingham Gas Department, to the Midland Association of Gas Engineers and Managers, because the Address is in fact a comprehensive and restrained account of gas manufacture from the engineer's point of view—cost of the therm into the holder, in relation to the distribution system. There is nothing florid about the Address, but there is more than a little good sense. "Yes, . . . but," is, we think, Mr. Tomlinson's motto as a man who has to produce and sell a commodity; and we think also that there is a great deal to be said in support of such a motto. Take, for example, his dispassionate analysis of steaming in vertical retorts. He concentrates on the cost of the therm into the holder in relation to throughput of coal in the installation, and not on "therms per ton of coal;" and we are sure that in this respect he hits the nail on the head. Before the therm standard came into being, at the end of each year congratulations were forthcoming with monotonous regularity that "so-and-so" had, during the year under review, obtained 14,000 c.ft. of gas per ton of coal carbonized, compared with (say) 13,900 c.ft. of gas during the previous year. There were no qualifying clauses, and their absence made everything appear very simple and praiseworthy.

But we have to consider these qualifying clauses; and this is precisely what Mr. Tomlinson does. His plan—it is the aim of every gas engineer—is to supply gas and coke of good quality at the cheapest price to the consumer, having regard to the customer-satisfaction clause. As to coke, the author concentrates on two aspects of the question—the coals carbonized and their uniform admixture. He evidently favours dry cleaning of coal, as distinct from the wet process, in which respect we do not entirely agree with his arguments; and he obviously favours careful mixing of the various grades of coal bought, prior to carbonization—in which respect we are in entire agreement. The view has been expressed consistently in the "JOURNAL" that uniformity of the quality of coke, quite apart from its moisture and ash content, is essential to the success of coke sales; and in a large works, where the raw material treated is a mixture of coals of different properties, uniformity of

the coke depends primarily on the careful mixing of the various grades of coal which are charged as one substance into the retorts. Everything should be done to ensure a uniform raw material; and the following quotation from Mr. Tomlinson's Address is significant: " At one of the Birmingham Works where coal mixing hoppers of 2000 tons capacity are installed and the various coals are divided into four classes and afterwards proportionately mixed, coke complaints are very infrequent."

It is, however, on throughput of coal per retort per day that the author concentrates; and he maintains that, as steaming is increased, so does the output of therms per retort per day decrease, though he would have amplified his case to advantage, we suggest, had he considered the effect of steaming on the coke market—a matter which he does not mention. His observations on increasing the throughput of coal in horizontal settings, while maintaining the temperature of the combustion chambers at its normal level, are both topical and important. He quotes the work of the Fuel Research Board, to which we drew attention in our issue of Jan. 6, p. 18. The essence of this work is the provision of sufficient available heat, as distinct from temperature gradient, to ensure a rapid rise in temperature of the charge of coal when introduced into the retort. Briefly, a high temperature gradient is maintained at all parts of the setting by an adequate volume of heating gases at the necessary temperature being circulated around the retorts. Already by this means it has proved possible to reduce the carbonizing period for a definite charge in horizontal retorts from 6½ to 7 hours instead of 11¼ hours; and further work now in progress is likely to yield still more remarkable results. We are glad that Mr. Tomlinson shares our views on benzole recovery, for all available data point to the recovery and refining from horizontal retorts or intermittent vertical chambers being a paying proposition under to-day's conditions. To our mind, one of the best means of " diluting " coal gas is by benzole extraction, for such extraction has an advantageous effect on the specific gravity of the gas, and hence distribution of the stripped gas does not present the same difficulties as are experienced when calorific value is reduced by other means.

A *Distribution Committee*

An announcement has been made which indicates that the vital problem of raising our ability to market the goods this country is so competent to produce to the high level called for in the strenuously competitive conditions of to-day is in a fair way to receive in growing measure the attention it deserves. At their biennial meeting at Washington last year, the International Chamber of Commerce decided to establish an International Committee on Distribution, which they have defined as " covering the various activities and processes involved between the production of goods in final form for use and their delivery to, and acceptance by, consumers."

This country was invited to nominate a Chairman of that important Committee, and the British Branch of the International Chamber have invited Sir Francis Goodenough (and he has agreed) to accept the post. This selection for the Chairmanship of the Committee dealing internationally with the whole field of marketing is a natural sequel to his work as Chairman of the Government Committee on " Education for Salesmanship." It is also an interesting prelude to the holding, in London, in the last week of July next, of the Fifth Triennial International Conference on Commercial Education, because Sir Francis, as Chairman of the British Association for Commercial Education, is responsible for the organizing of that conference.

The conference, which will be presided over by Sir David Milne-Watson, has been accorded the strongest possible support alike by the Government, by the leading Educational Authorities, by representatives of the Dominions and Colonies, and by a large number of representative leaders of Industry and Commerce. The conference, moreover, has been fortunate in securing the support of H.R.H. The Prince of Wales, who has agreed to become Royal Patron and to address the conference at its concluding session on July 29.

Tar for Good Roads

Or perhaps we should have said " good tar for good roads," because the popularity or otherwise of tar for road making and road surfacing is dependent on the supply of a material of defined properties. Only a comparatively few years ago tar sold to surveyors was a very different proposition from the material which is supplied to-day; and a large measure of credit for this change is due to the British Road Tar Association, who through their activities on the technical aspects of road tar have done so much to improve the product and ensure uniformity, and through their excellent propaganda work have told those interested of the virtues of the properly manufactured material. Of late years the Association have rightly concentrated on investigations regarding the best methods of application of specified road tar, realizing the importance attaching to its proper use. Good road tar improperly employed means unsatisfactory roads; and the purport of a paper by Mr. W. E. Cone, Technical Adviser to the Association, published in this issue of the " Journal," is to explain modern ideas of road construction and road surfacing having tar as a binder. It is not sufficient in these competitive times merely to sell so many barrels or so many tanks full of very excellent tar; the seller must be able to advise on its application to the roads, even though in some instances this advice is not required. The seller of tar must be aware of what constitutes a good road and of the modern methods of construction necessary to withstand the onerous tasks demanded of our roads to-day.

Modern trend of opinion is favouring the use of a more viscous tar than hitherto; and Mr. Cone believes that, as a result of further experience, tars of even higher consistency will be demanded. And if the great advantages of tar for the efficient and economical construction of roads are to be maintained, the influences of location, foundation, traffic, materials, and manufacturing and constructional methods must be studied. The author explains that the tendency is to produce a denser mixture, characterized by a much smaller proportion of voids than was usually associated with tarred macadam in the past. Experience has shown the desirability of incorporating with the coarse and medium aggregates suitable quantities of mineral filler. The stability of the mixture increases as the voids in the aggregate decrease, provided the proper amount of tar is used. By varying the size and grading of the aggregate and the consistency of the tar, it is possible to control the stability of the mixture to the degree necessary for roads designed to carry light, medium, or heavy traffic. Mr. Cone speaks of a " properly balanced mixture of tar and aggregates." To our mind " properly balanced " is a most important expression, for research carried out recently—in particular by Mr. H. Pickard, of the South Metropolitan Gas Company—has made it clear that the question of the quantity of tar used in relation to the amount and nature of the aggregate far outweighs in importance the other factors such as the consistency of the tar and the temperature of its application; and in regard to wetting properties, consistency plays no practical part in determining the adhesive value of a tar. It is the size of the aggregate, and hence the extent of surface to be wetted, that requires consideration in relation to the initial consistency of the tar and the road temperature at the time of application.

This question of " balanced mixture " applies equally to road construction and road surfacing. Mr. Cone remarks that " in dealing with the surface tarring of roads, the salient features of progress are the use of higher consistency tars and large gauge hard chippings. From observations made in different parts of the country, such methods have been particularly successful in providing a non-slippery surface, both for water-bound and other types of roads." The author also comments on the lack of attention paid to the nature of the soils on which roads are laid, and to the traffic weights and impacts to be resisted. In the absence of accurate information on these, and other similar, important points, there is a tendency to play for safety by laying additional thicknesses of material—which is not the way to increase effici-

ency and economy in the use of tar. "There would appear to be no useful purpose served by increasing the thickness of the wearing surface beyond 3 in., and certainly no advantage is to be gained by laying the material in two separate courses. The generally accepted belief that tarmacadam can be laid on any sort of foundation has been very largely responsible for the methods of manufacture and construction which are now in vogue."

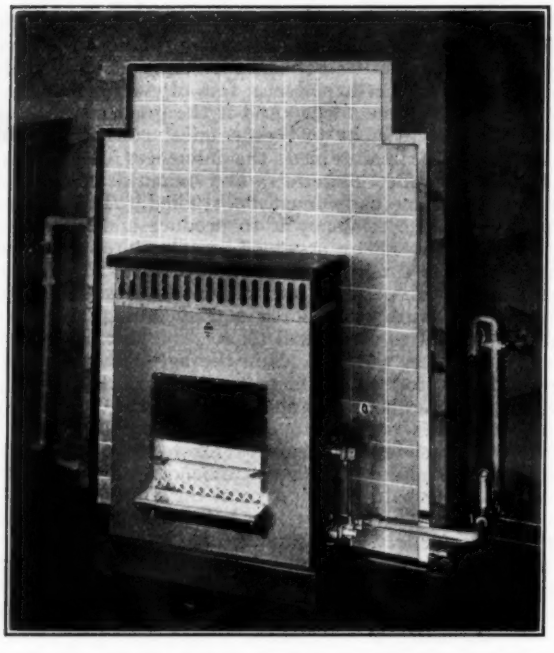
During the past twenty-five years tar has grown steadily in favour, until it is now used to a greater extent than any other road-making material in this country. This has been brought about by the application of scientific principles. Much has been accomplished, but it is obvious enough from Mr. Cone's paper that much more remains to be done before the sellers of tar can claim to be selling it to the best advantage.

CORRESPONDENCE

Development in Gas Fires Design

SIR,—May I tender my best thanks for the appreciation of my letter ("JOURNAL" for Jan. 27) by Mr. J. H. Brearley, and enclose illustrations to give an idea of the appearance of the gas fire when it is fitted in suitable surroundings.

Prof. Knoblauch, of Munich, one of the most prominent German physicists, determined the ratio of radiant and convected heat in 1925 ("Gas- und Wasserfach," 1926, No. 42, Oct. 16). These tests were executed with what I should call a transitional type of gas fire, not of the most modern pattern, but approximating the construction that is in use to-day.



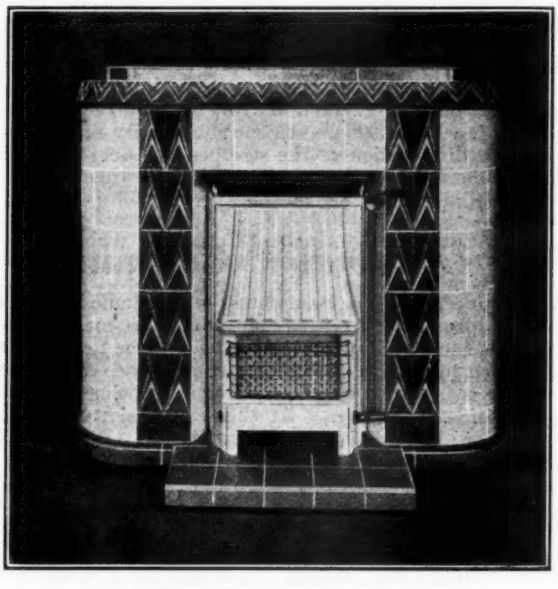
Radiation and Convection with the Askania Fire.

He found that the ratio of radiant heat amounted to 39 p.ct.; the ratio of convected heat amounted to 46 p.ct.; the ratio of flue heat amounted to 15 p.ct. The last was increased to 20 p.ct. by diminishing the percentage of convected heat in 1928. All these figures are given according to the German scientific method in net calorific power. When writing my letter of January, I was, however, careful, as I may assure the Cannon Iron Foundries, Ltd., to convert all figures into gross calorific power.

I should furthermore like to state that I really should have preferred to give actual figures of radiant efficiency, but the word "actual" made me hesitate. Tests on radiation are so complicated and liable to so many mistakes that even if a manufacturer gives figures obtained through very careful tests his work may quite unjustly be criticized if compared with figures of a competitor, which may be worked out in a different but not less careful manner. This is for me, and possibly for many other manufacturers of gas fires, the only reason to rely merely on relative figures.

It seems to me to be impossible to infer from a certain percentage of CO_2 the probable percentage of CO. That may be an expedient if a fire of a certain construction is to be compared with another one of the same model, but it will invariably fail when comparing different apparatus. A water heater, for instance, can have 10 p.ct. CO_2 (with German standard gas) without any substantial percentage of CO. With a radiant gas fire one has only to take care not to disturb the blue cone of the burning gas (about 1 in. long), which should have a proper supply of air, in order to ensure a low percentage of CO. Whether more or less dilution is caused in the remaining part of 6 or 7 in. of the radiants in consequence of the characteristic features of the different constructions can have no influence on perfect or imperfect combustion.

We found the percentage of CO to be only 0·02 of the theoretical flue gases by the exceedingly delicate method described in the "Gas- und Wasserfach," 1929, p. 853. This result was later confirmed by independent investigation in a laboratory. Even with down-draught an increase of CO could not be ascertained owing to the very good protection of the blue cone in the inner corner of the inclined radiants against disturbance by such down-draught.



Askania Fire with Coloured Tile Surround.

Fears that only an expert mechanic is able to fit new radiants, or that broken radiants would fall out of the opening and over the canopy in front, involving risk of damage, are theoretical and have no proved foundation in practice.

I did not, and I never shall, pretend that our fires are generally better than those of English make; on the contrary, I look at some features of the English gas fires as being very fine. This appreciation need not, however, prevent us from following other lines of development, due to differences in climatic conditions and taste.

While taking this point of view I appreciate the good wishes of Mr. Brearley, and the suggestion of the Cannon Iron Foundries, Ltd., to test the various types of fires, trusting that some progress may result on the way towards our mutual goal—*i.e.*, ever-increasing gas business.

J. KORTING.

Askania-Werke Aktiengesellschaft,
Dessau,
March 3, 1932.

Coal-Coke Mixtures for Domestic Purposes

SIR,—The 36 million tons or so of raw coal which are being burnt in the domestic fireplaces of this country are not being replaced by smokeless fuels as rapidly as either the makers of the latter or those who realize the damage done by about 3·3 million tons[1] of tarry soot would like.

Perhaps if all the gas-works could see their way clear to produce a freer burning coke with a minimum of ash the replacement would be accelerated, but unless or until this happens it is believed that the adoption of the suggestion outlined below would be of advantage, both to the gas-works, by increasing their sales of coke, and to the community, because this increase would replace raw coal.

May I first state briefly what appear to be the reasons why the public will pay £2 a ton for raw coal, or even more for certain free-burning cokes, and only a little over £1 for ordinary gas coke. The main reason is probably the difficulty of igniting gas coke, both when lighting the fire and when replenishing it if the fire has burned low. It might be possible to eliminate this difficulty by the installation of special grates, but expense precludes this, and even if it could be done there would still remain a second reason—namely the attraction of and demand for a *blazing* fire.

The mysterious but undeniable attraction of a fire burning with luminous flame is often put down to sentiment or conservatism, but it is so widespread, and so unamenable to argument, that one is led to look for some definite reason underlying it. It may well be that Dr. Marie Stopes is right in her belief that a blazing coal fire emits rays of physiological value, comparable perhaps to the stimulating rays in sunlight[2]. If this is so it is doubtless the feeling of comfort produced by such rays which makes a coal fire so attractive. Dr. Carpenter made some interesting remarks in this connection at the recent annual meeting of the South Metropolitan Gas Company[3].

Dr. Marie Stopes does not think that we should stick to raw coal, but suggests that a low-temperature coke might be made which would burn with a partly luminous flame, and yet be comparatively smokeless. At present there seems little likelihood of such a fuel being produced in really large quantities, but there is no doubt about the demand for a fuel of this type.

Now a mixture of coal and gas coke, in, say, equal proportions by weight, is both easy to ignite and burns with a luminous flame. This may be well known, but it is probably not widely realized that the mixture is on the whole quite equal to the best house coal as regards ease of ignition and "cheerful" appearance. The rough nature of the coke provides channels which allow air to pass through, causing the mixture to burn brightly, with a radiant efficiency superior to that of coal. The mixture is surprisingly easy to ignite even in a modern well-grate, and it gives the cheerful luminous blaze which makes house coal so popular. Its use should accustom the public to use more coke, with benefit both to the gas-works and the purity of the atmosphere.

As regards cost the mixture is, of course, much cheaper than house coal. A variety of coals may be used, a low ash content being essential. Thus a mixture of equal weights of washed nuts and ordinary vertical retort coke gives an excellent fuel. The coal in the mixture would cost less than the sale price of coke, and after allowing for the cost of mixing, the mixture could be sold at a price equal to, or slightly higher than, that of coke. This comparatively low price, together with the excellent properties of the mixture, should ensure its rapid popularity.

It is very unlikely that the average householder will ever be persuaded to purchase coal and coke separately and mix them himself. Mixing is a process which is easily done in large quantities by machinery, but it is laborious and unsatisfactory if it has to be done by hand. Three storage bays become necessary, one each for coal, coke, and mixture, if the mixing is to be done properly, and few people have room for this. But for the difficulty of mixing, mixtures would probably have been in use long ago, and because of it, it is unlikely that they will become popular until either the gas-works or the coal dealers offer a ready-made mixture.

Yours, &c.,
"SMOKE ABATER."

[1] The Smoke Abatement Handbook, 1931, p. 11.
[2] "Armchair Science," 1931, 2, 689. "Fuel," 1931, 350.
[3] "GAS JOURNAL," Feb. 17, 1932.

PERSONAL

Sir JOHN CHANCELLOR, G.C.M.G., G.C.V.O., has been elected to a seat on the Board of the Imperial Continental Gas Association.

Mr. DAVID MORTON, of Kinross, a native of Kirkcaldy, on the Firth of Forth coast, has been appointed by the Town Council, from 54 candidates, to the office of Gas Manager at Arbroath, in room of the late Mr. A. C. Young.

Mr. M. E. RAMPLIN, Distribution Superintendent of the Elland-cum-Greetland Gas Company, has secured a similar appointment with the Morecambe and Heysham Corporation Gas Department. There were 52 applications for the position.

Mr. T. W. TIPLADY has retired from the position of Manager of the Bakewell (Derbyshire) Gas Undertaking after a service extending over 33 years. The Bakewell Urban District Council have placed on record their high appreciation of the loyal and faithful services of Mr. Tiplady. They have appointed his son, Mr. JOHN E. TIPLADY, as his successor in the position of Gas Manager for one year from March 31, 1932.

On Monday, March 14, the members of the Wakefield Gas-Works Sports Club made a presentation to Mr. C. W. WARD, President of their Club and Engineer and Manager of the Company, of an ink stand, pen, and a case of pipes as a token of their esteem and in commemoration of his election as President of the Manchester District Association of Gas Engineers. The Chairman of the Sports Club, in making the presentation, remarked on the rapid progress made in the Club, and the recreation facilities now afforded, in which Mr. Ward has taken a keen interest since the inception of the Club in 1928.

OBITUARY

A. J. BOND.

After thirty-one years as Engineer and Manager of the Port Talbot and Aberavon Corporation Gas Departments, Mr. ALFRED JOHN BOND has died at Port Talbot at the age of 69. He was appointed Manager of the Aberavon Gas-Works in 1901, and in 1922 succeeded in retaining the position under the newly formed Borough of Port Talbot, the gas-works at Margam, Cwmavon, and Aberavon being placed under his charge. He held the office of President of the Wales and Monmouthshire Association of Gas Engineers and Managers in 1919.

Representatives of a number of South Wales gas undertakings were in attendance at the funeral of Mr. Bond. The Mayor of Port Talbot, Councillors, the Town Clerk, and all the borough officials, together with Mr. W. Clark Jackson (Neath Gas Manager, on behalf of the Wales and Monmouthshire Association of Gas Engineers and Managers), and Mr. J. A. Studburt (representing West's Gas Improvement Company, Ltd.) were present.

THE NEWS OF THE WEEK

Nearly £2500 is to be spent by the Southport Corporation Gas Department for the conversion of premises in Eastbank Street into showrooms and stores.

A Deficiency of £7786 on the past year's working of the Stockton Gas Undertaking was shown by a statement submitted at a meeting of the Stockton Town Council. It was decided to increase the price of gas from the March readings by 3d. per 1000 c.ft.

Canadian Gas Association.—The 25th Convention of the Association will take place in Winnipeg on June 9 and 10 of this year—the first time in the history of the Association for the Convention to be held in the West. The Premier of the Province of Manitoba has written a letter to members of the Association extending to them a most cordial welcome.

A Feature of the Swiss Gas Industry at the present time is the increasing use of the pressure type of gasholder. Thus, since 1929, twenty-one such holders have been installed in the country, while during the year 1930-31 plans for the erection of thirteen new gasholders were submitted for approval, seven of them being of the pressure type, four water-sealed holders, and two of the dry pattern.

The 47th Annual Re-Union of the employees of Kilmarnock Corporation Gas Department was held last week. Convener W. Brown of the Gas Committee presided over a company of 150, which included the Provost and Magistrates, the Manager and officials of the gas undertaking, and several gas managers from neighbouring towns. The Engineer and Manager, Mr. Chas. Fairweather, recalled that he had attended the first re-union 47 years ago, just after his father had been appointed Manager.

When the Plymouth City Council met on March 7, Mr. J. C. Farrell moved disapproval of a recommendation by the Tramways and Transport Committee relative to the purchase of benzole from the Gas Committee at a shilling per gallon. Mr. Farrell said that if the benzole was sold to outside firms a profit could be made, which might be used to reduce the cost of gas to the consumers. It was explained that if it had been suggested that the plant was to be installed for the purpose of extracting benzole for sale to a private company the Council was not likely to have agreed to it, though the Tramways Committee had not sought the manufacture of benzole within the Corporation. The motion to disapprove the minute was defeated.

Gas at Specially Reduced Prices, to aid the newly formed Industrial Development Committee in encouraging new industries in the town, is being offered by the Stalybridge Gas Committee. Their enterprise appears to be bearing some fruit. Messrs. Fyldes, of Collyhurst, Manchester, are transferring their extensive coppersmith, &c., works to the recently dismantled cotton mill of Messrs. Hibbert & Harrison, in Chapel Street, and they promise to be very large users of gas for their industrial purposes. As a result negotiations are in progress between the firm and the Corporation Gas Committee for a supply which is estimated to be between 8000 and 10,000 c.ft. per hour each week of fifty hours, which, estimated at the lower figure of 8000, will amount to about 20 million c.ft. per year.

The Relative Value of gas and electricity for public lighting was considered at a meeting of the Accrington Town Council on Feb. 29. Ald. Bury, Chairman of the Public Lighting Committee, referred to the proposed lighting of Queen's Road by electricity, and said the Committee had suggested that the whole question of lighting be gone into in conference with the Electrical Engineer, the Lighting Superintendent, and the Gas Manager, in preparation for next season. There was a great difference of opinion among experts on the merits of gas and electricity. They were told that in London the best lighted streets were lighted by gas, but the other day it was stated that Piccadilly Circus was soon to be the most brilliantly and scientifically lighted place in the world, and gas would give place to electricity. What conclusion the Accrington Watch Committee would come to after hearing the experts he did not know. The Council approved the proposal.

An Hour's Discussion was required by South Shields Town Council before it was decided to adopt gas washboilers in the houses to be built in the Egerton Road portion of the Council housing scheme. The discussion centred round the alternative types of boilers—gas, electric, or coal-fired—and finally the offer of the South Shields Gas Company was accepted.

Incandescent Mantle Production.—The output in this country in 1930 of mantles for incandescent lighting, whether collodionized or not, was returned in the Production Census as 352,000 gross, valued at £639,000. In 1924 the output was returned as 305,000 gross, valued at £574,000. There was thus an increase in production of 15½ p.ct. in 1930 as compared with 1924, the value increasing by 11½ p.ct.

Gibbons (Dudley), Ltd.—The Directors submit a balance-sheet, showing a net profit for the year, after providing for depreciation, of £8135, which, added to the amount brought forward from last year, £9564, makes a total of £17,699. From this amount the full 7 p.ct. preference dividend, free of income-tax, for the year, was paid on June 30 and Dec. 31, 1931, absorbing £2100, leaving a balance of £15,599 to be dealt with. The Directors recommend that a dividend of 5 p.ct. on the ordinary shares, less income-tax, be paid, which, after the deduction of further Directors' fees, leaves to be carried forward to next year the sum of £10,134 1s. 8d.

Imperial Continental Gas Association.

The Imperial Continental Gas Association announce that, as a re-valuation of the Company's assets discloses a considerable surplus over the book-value, the Board have decided to recommend to the stockholders that part of this surplus be capitalized and that a bonus distribution of stock be made at the rate of 100 p.ct., thus doubling the existing issued capital. The new stock will rank *pari passu* with the existing stock for the final dividend of the year ending on March 30, 1932. A general meeting will be held on March 22 to pass the necessary resolutions.

The 1931 accounts of the associated Companies have been received, and the Board are able to indicate that they will recommend a final dividend at the rate of 7 p.ct. (actual), less income-tax, upon the doubled capital. This, taken with the interim dividend of 7½ p.ct. (actual), less tax, paid on Nov. 13 last, is equivalent to a rate of 10¾ p.ct. (less tax) for the year upon the doubled capital.

"Coal, the Prime Mover."

In an address on "Coal, the Prime Mover," given in London to the 1912 Club, Mr. R. G. Clarry, M.P. (Chairman of the British Road Tar Association), said that coal was the only British source of light, heat, and power. Other industrial nations had alternative natural resources, such as petroleum oil and water power.

In comparing 1913 with 1930, Mr. Clarry said that coal shipped abroad showed a decrease of 23,250,000 tons, and the only increases from a long list of reductions in home consumption were in the gas and electricity industries. Outside Great Britain—in spite of improvements in methods of coal consumption and the adoption of substitutes for coal—both the production and the consumption of coal had exceeded the pre-war figures.

Carbonization, continued Mr. Clarry, was an ideal way of obtaining the fullest use of coal. Of the three types of carbonizing plant the low temperature was the only one not definitely attached to an industry consuming one or more of its products, and consequently the economic success of a low-temperature undertaking was dependent on finding satisfactory markets for all its products. Despite the brains and capital which had been put into that type

of carbonization, it could not yet be said to be commercially successful.

The term " oil from coal " needed more exact definition. Unlike all other processes, hydrogenation allowed for the conversion of coal either into petrol and a residue of ash, or into petrol, Diesel oil, and fuel oil in variable proportions. As there was a reduced production of coal of over 43 million tons during 1930 compared with 1913, it was clear, said Mr. Clarry, that, if it were possible to produce all our oil and petrol requirements from our coal, that would not in itself solve the coal problem.

Year's Working of Radiation Ltd.

At the annual meeting of Radiation Ltd., to be held on Monday next at Southern House, London, E.C. 4, the Directors will present a satisfactory report for the year ended Dec. 31, 1931. After bringing in £167,010 brought forward from 1930, the balance of the revenue account is £460,764. After deducting the interim dividends (£77,498) paid in October last, there remains at disposal the sum of £383,266, which the Directors recommend be appropriated as follows:

To pay a final dividend of 3 p.ct. to Dec. 31, 1931, on the preference shares, less income-tax; to pay a final dividend of £9 7s. 6d. p.ct. to Dec. 31, 1931, on the ordinary shares, less income-tax, making a total gross dividend of 12½ p.ct. for the year; to carry forward to next year £199,710.

The Directors consider that the results of the past year's trading have been satisfactory, which is due to the continuance of the policy and the line of research laid down in past years, and the continued development and production of entirely new apparatus.

Lincoln 'Buses to Run on Gas?

When the Transport Committee of Lincoln City Council put forward a recommendation to purchase more omnibuses for the City, Councillor A. L. Bower asked whether consideration had been given to buying 'buses which ran on gas. He explained that vehicles running on compressed gas were being tried out at Rotherham and Birmingham, and that the Lincoln Gas Manager would receive particulars as to performance in a few days.

Councillor J. K. Fox, Chairman of the Committee, replied that he was glad of the information that there were such things as gas-propelled omnibuses, because they could get gas cheaper than petrol. He promised that the question would be given consideration.

Association of Public Lighting Engineers.

Ninth Annual Meeting, Conference, and Exhibition

At a meeting of the Council of the Association recently held in Birmingham during the British Industries Fair, arrangements were decided in connection with the forthcoming Annual Conference under the Presidency of Mr. Harold Davies, Engineer and Manager to the Chesterfield Corporation Gas Department. At the invitation of the Mayor and Corporation of Blackpool, the Conference will be held in that town from Monday, Sept. 5, to Thursday, Sept. 8 next.

The programme, subject to any slight alterations that may arise, will be as follows:

MONDAY, SEPT. 5.

7.30 p.m. Formal opening of the exhibition of lamps and lighting appliances at the Imperial Hotel by the Mayor of Blackpool. (Short addresses, followed by light refreshments.)

TUESDAY, SEPT. 6.

10. 0 a.m. Official welcome and opening of the Conference by the Mayor at the Imperial Hotel. Induction of new President. Presidential Address and reading of papers and discussion.

1. 0 p.m. Civic luncheon to members and delegates by the invitation of the Blackpool Corporation.

2.30 p.m. Members and delegates re-assemble for short addresses on exhibits. Inspection of exhibition of lamps and lighting appliances.

WEDNESDAY, SEPT. 7.

10. 0 a.m. Transaction of formal business. Assemble in Conference Room for the reading and discussion of papers.

1. 0 p.m. Association luncheon at the Imperial Hotel.

2.30 p.m. Members and delegates re-assemble at the Imperial Hotel for the further reading of papers.

THURSDAY, SEPT. 8.

Opportunity will be afforded for visits to the Isle of Man and various places of interests in the neighbourhood.

It is proposed that the exhibition will be open to the public during Wednesday, Sept. 7.

A number of interesting papers will be presented in which the administration of public lighting and the requirements of towns of small and moderate size will be dealt with. Among those who are expected to contribute papers will be Councillor Minshall, Chairman of the Public Lighting Committee, City of Sheffield; Mr. I. H. Massey, Public Lighting Superintendent, Oldham; Mr. J. H. Clegg, Engineer and Manager, Burnley Gas Department; and Mr. H. H. Collins, Borough Engineer, Colchester.

Mr. E. M. Severn, Public Lighting Superintendent, South Metropolitan Gas Company, has been selected by the Council for the new Vice-President.

Power and Fuel Bibliography.

In spite of the exceptional difficulties which confronted any form of publishing during 1931 and in particular new publications, the " Power and Fuel Bulletin " issued by the British National Committee of the World Power Conference has had a successful first year, and the subscriptions received amply warrant its continuance.

The National Committees in Germany and Japan also began publication during 1931, and, through the assurance of immediate co-operation from a large number of industrial countries, the year 1932 should witness well on the way to completion the scheme to provide a complete international power bibliography on the wide field covered by the World Power Conference. The preliminary difficulties have been overcome, and, by means of the International Decimal Classification system, the first successful attempt at international biblography should prove an instrument of daily practical value in the hands of engineers and technical administrators throughout the world.

National Gas Council.

Meeting of the Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council was held at 28, Grosvenor Gardens, London, S.W. 1, on Tuesday, March 8, 1932—Sir DAVID MILNE-WATSON, LL.D., D.L., in the chair.

The Late Sir Arthur Duckham.—Before proceeding to the business of the meeting, the Chairman paid a moving tribute to the late Sir Arthur Duckham—a man of rare and unusual gifts, whose loss would be felt not only within the Industry but far outside it. A vote of sympathy was passed, all the members standing.

Restrictions on the Use of Gas in Council Houses—Kettering Gas Company's Bill, 1931.—It was reported that the second reading of this Bill was expected to take place in the House of Commons on March 14.

Effluents Disposal.—It was reported that the Pure Rivers Protection Society had drafted a Bill to deal with the subject of the disposal of trade waste and effluent, which would probably be introduced in the House of Lords at an early date. The object of the Bill, it was stated, was to give statutory effect to the Second Report of the Joint Advisory Committee on River Pollution set up by the Ministry of Health and the Ministry of Agriculture and Fisheries. It was added that the Draft Bill had been considered by the Joint Committee of the Pollution Sub-Committee and the Riparian Owners' Committee of the Federation of British Industries, who were generally favourable to the Bill, subject to certain drafting amendments. The effect of the Bill would be to impose upon all sanitary authorities the obligation to receive trade effluent, subject to regulations to be made by agreement between the sanitary authorities and the traders. Such regulations might provide for the payment of a charge for the reception and disposal of trade effluent where such a charge was agreed by the parties affected. If the parties were unable to reach agreement with regard to the regulations, the whole matter might be referred to the Minister of Health. The Board agreed to remit the matter to a Special Committee which had previously dealt with this question, as it was of considerable importance to the Industry. It was stated that the Bill related only to England, but that it was understood that a similar Bill applicable to Scotland was being drafted by the Scottish Advisory Committee on Rivers Pollution Prevention.

Gas for Stand-by Lighting in Cinemas and Places of Amusement.—It was reported that a deputation from the Council, together with representatives from the five London Gas Companies operating within the area of the London County Council, had appeared before the Entertainments (Licensing) Committee of the London County Council on Feb. 24, and that this meeting was followed by a further deputation from the Entertainments Protection Association. Mr. Ogilvie, representing the National Gas Council, had particularly emphasized the reliability of gas, which

THE NEWS—continued.

(he urged) should be the main consideration in approving safety lighting. The case for the Entertainments Protection Association, Ltd., was a strong plea that they should not be put to any further expense. It was hoped that as a result of the case made out by the Gas Industry the London County Council would not proceed with their proposed regulations prohibiting the use of gas for emergency lighting in cinemas and other places of public entertainment.

Gas at Cookery Demonstrations in Connection with Agricultural Shows.—A letter was reported from the Ministry of Agriculture, referring to the promise made by the Ministry to let the Council know their show programme for the year. In enclosing their programme the Ministry added that they were not undertaking cookery demonstrations this year at agricultural shows, so that it was feared there would be no opportunity of utilizing gas at such exhibits. In a later letter they gave a list of such shows, giving the dates when, and the places where, they were going to be held. It was reported that the Council was taking up the matter with the British Commercial Gas Association.

Damage to Gas-Works by Aircraft.—It was reported that quotations for this risk had been received from a firm of Insurance Brokers, and would be published in the Council's Monthly Report.

Gas Institute of New Zealand.

The Eighth Annual Meeting of the Gas Institute of New Zealand was held at Masterton on Feb. 24-26, under the Presidency of Mr. J. Learmonth.

One of the papers read was by Mr. A. Dougall, of Messrs. Dougall, Coombs, & Co., Ltd., Structural Engineers, Wellington, on "The Hawkes Bay Earthquake," with notes on its effect upon Gas Undertakings in Hawkes Bay. As Mr. Dougall was for 12 years General Manager and Chief Engineer of the Wellington Gas Company, Ltd., and has since then been in business on his own account, this paper will be of interest to gas men generally throughout the world.

Our readers will remember the article by Mr. Dougall, on the Hawkes Bay Earthquake, which was published in the "JOURNAL" last December, p. 723.

Liverpool Company's Handbook.

"To be, or not to be," alive to the latest triumphs of research and invention is the burning question of the moment. Whether to cower in the rut of Yesterday for protection against the slings and arrows of progress and competition, or take advantage of the modern application of gas to all domestic and industrial purposes, and so place yourself out of range? That is the question! Economy does not necessarily mean sacrifice, and greater efficiency need not involve increased expenditure. The Gas Industry rides the crest of the wave of universal popularity because it refuses to entertain any business that is not distinctly profitable to the consumer in every sense—æsthetic and artistic as well as economic. That is why the Liverpool Gas Company invites its consumers' perusal of a delightful little illustrated handbook, dealing in an interesting manner with every phase of the Company's operations in both the domestic and industrial fields.

After some general statements in regard to what gas can do in the home and the factory, the booklet goes on to trace the history of the Liverpool Gas Company from the year 1816, when Mr. Jonathan Varty, a coach-builder of Dale Street, met with a few others at the Crown Inn, Redcross Street, to consider a proposal made by an engineer named Hargreaves for the lighting of the city by gas, up to the present day when the Company ranks as the largest provincial gas company in Britain, with a capital of £3,837,631 and a gas output of over 7488 million c.ft.

Particulars are given of the Company's area of supply, its co-partnership scheme, the price of gas, and its service to the consumer, together with details of hire and purchase terms for appliances. The new smokeless fuel, "Dryco," is mentioned, and its attendant advantages are emphasized.

A comprehensive section is devoted to the utilization of gas and coke for industrial purposes, while other sections deal with the correct operation and application of various domestic appliances. In conclusion, the method of reading one's gas meter is simply explained, so that consumers can make a habit of checking their consumption regularly, and so avoid waste.

Sales of Gas Appliances in the Argentine.

A report by the Commercial Secretary, H.M. Embassy, Buenos Aires, on the Economic Conditions in the Argentine Republic, has been published by the Department of Overseas Trade, and is obtainable at H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 4s. net. It is dated Oct. 31, 1931, the previous report being dated Oct. 31, 1930.

In the report it is stated that a decided decline has occurred in the sale of gas cookers and appliances compared with the previous year. The total number of appliances sold in Buenos Aires during the first seven months of 1931 represents a decrease of 42·9 p.ct. compared with 1930. Of the 5343 appliances sold during this period, 3504 were gas cookers, 65 p.ct. being of United Kingdom manufacture; 1110 were water heaters, 45 p.ct. being supplied from the United Kingdom; while the remaining 729 were sundry appliances, all of United Kingdom origin. The percentages of British appliances sold during the year 1930 were: Gas cookers, 84 p.ct.; water heaters, 47 p.ct.; and sundries, 100 p.ct.

Gas in Wrought-Iron Manufacture.

Should the experiments that are now taking place at the works of the Midland Iron Company, Ltd., Rotherham, in the application of gas to the manufacture of wrought iron prove successful, there is a bright future both for the use of gas for this purpose, and also for wrought iron, which, like most other trades, has suffered severely during the past few years.

The experiments, as far as they have gone, give every promise of success. The wrought iron trade has been going through a period of severe depression, but it is gratifying to learn that in some instances manufacturers of this product are still alive and to the front, in spite of the fact that during the past ten years the number of firms making wrought iron has been reduced by practically 75 p.ct.

The manufacture of wrought iron is still being pursued energetically in Rotherham at the works of the Midland Iron Company. These works have been established about 86 years, and have seen many "ups" and "downs," to the extent, unfortunately, of getting into the Receiver's hands in 1929, from which, even in these times of depression, they emerged in December, 1930, and have now been reorganized. That there is still a demand for "genuine wrought iron" cannot be disputed.

The Company have recently taken advantage of a supply of gas from the Rotherham Corporation, and have installed it in one of their furnaces. Although only in the experimental stage, the tests made with regard to consistent heating of material, the reduced loss in output, and other economies in the shape of coal, castings, labour, &c., are so satisfactory that there seems to be a future for this method of working. So far as this particular trade is concerned, it is believed that this is the only furnace of its kind fired by high grade gas in this country. The necessary alterations to the existing furnace to use gas have been designed and carried out by the Midland Iron Company's own staff, and from the experience gained, it is thought that even greater economies can be effected. The experiments are being continued with the able assistance of the Manager of the Rotherham Department (Mr. John T. Haynes) and his staff. Should the tests continue to prove satisfactory it is more than possible an extension of this method of gas firing will be adapted to other furnaces.

Centenary of Hastings and St. Leonards Gas Company.

In later columns of this "JOURNAL" will be found an account of the annual meeting of the Hastings and St. Leonards Gas Company, from which it will be seen that the Company has enjoyed a highly successful year. This is all the more gratifying since 1932 is the centenary of the Company's formation. Preceding the meeting was a luncheon to the stockholders, the Chairman of the Company, Mr. A. M. Apel, presiding. There was no formal toast list, but on the suggestion of one of the guests thanks were given to the Chairman and to Mr. C. F. Botley, the Engineer and General Manager.

In the course of a few remarks, the Chairman announced the following forthcoming events in connection with the Company's centenary. A dinner to a number of the larger representative consumers would be held shortly; the Institution of Gas Engineers would make a flying visit during their conference week in London in June. This would take the form of a luncheon at the Queen's Hotel, followed by a

THE NEWS—*continued.*

motor coach trip, to include some of the beauty spots in the vicinity. The co-partners' annual outing, which was usually a half-day trip, would this year be a whole day one.

A Hundred Years of Progress.

Although the hundredth milestone has been passed, ancient records reveal that gas-works were established in Hastings a considerable time before 1832, for in the year that the Company was formed £12,000 was paid for the existing plants and mains. It may be assumed that the works were established some time between 1812 and 1820, and that a Mr. Bryan, who was a member of a firm of London engineers, and who lived at Maidstone, was primarily concerned.

The progress of the Company was comparatively slow at first, for gas was used entirely as an illuminant. In 1854 the output was 20½ million c.ft. This grew to 38½ millions in 1861, 97 millions in 1871, 179 millions in 1881, 310 millions in 1891, and 602 millions at the present time. The supply of gas, which was in the early days confined to Queen's Road and the Old Town area, has been extended in all directions within a radius of 14 miles from the Glyne Gap Works.

In 1854 the Directors found it desirable to apply for an Act of Parliament, and the Company has since operated under statutory powers. In 1865 and 1883 other Acts were obtained and further Parliamentary powers became necessary in 1899, when circumstances required that the works should be moved to another site. This was the origin of the existing works at Glyne Gap, which were established with the idea in view of supplying Bexhill—a project which did not materialize.

The Company has always been associated with progressive movements in the Industry.

Intermittent Vertical Chambers at Southampton

Official opening of new gas manufacturing and coke conveying plant

The Mayor of Southampton (Councillor F. Woolley, J.P.) moved a lever which released a charge of coke from one of the chambers into the skip beneath. His Worship said his task had been a light one, but it was a big ceremony in that it signalized the completion of a work of considerable enterprise carried out by the Directors and Management of the Southampton Gaslight and Coke Company.

"These are days in which well-considered enterprise is needed more than ever before," continued the Mayor, "and here we have an outstanding example of the right kind. I feel that you would wish me in your name—and I do so on behalf of the town of Southampton—to congratulate the Board and the Management of the Company upon the enterprise they have shown, and to wish that this new plant will achieve all that they expect, and a little more."

Sir Russell Bencraft (Chairman of the Company) briefly thanked the Mayor for his kindness and good wishes.

New Carbonizing Plant.

The new installation comprises one bench of 24 Woodall-Duckham intermittent vertical chambers, complete with producers, recuperators, coal and coke handling, and waste-heat recovery plant. The bench is divided into four settings of six chambers, each bed having its own producer and recuperator, and thus being quite independent of the other beds.

Chambers.—Each chamber is 21 ft. high and of rectangular section, approximately 10 ft. long, the width tapering evenly from the bottom to the top. The chambers have a capacity of 3½ tons of coal each, and are charged and discharged intermittently at intervals of from 10 to 14 hours, depending on the class of coal carbonized and the quality of gas desired. Arrangements are made for the admission of steam at the bottom of each chamber, so that water gas may be produced during the latter portion of the carbonizing period.

The chambers, which are constructed throughout of silica blocks, are heated by producer gas generated from coke and burning in horizontal flues between each pair of chambers. The flue temperatures vary from approximately 1300°-1350° C. at the bottom to 900°-1000° C. at the top.

Each bed of six chambers has one producer and two recuperators, which are built into the setting and rise from the ground floor to the full height of the bench. The producers are of the step-grate type, constructed with ample grate area to facilitate the use of low-grade fuel, and each is provided with three ashing doors at the bottom and two charging lids at the top floor.

The coal (which has been previously crushed at the central crushing station), the coke for the producers, and the breeze which is introduced before the coal for the purpose of protecting the bottom doors, are raised from ground level by means of an electrically-operated automatic skip hoist feeding a shuttle belt. The latter distributes the material to overhead steel bunkers which are in each case of 48 hours' capacity.

Each chamber is provided with three charging holes at the top, and with a strongly constructed and hinged bottom door. An electrically-propelled charging car runs on rails above the chamber tops, and is fitted with measuring hoppers, which are filled with the requisite amount of coal and breeze from the overhead bunkers.

On the completion of the carbonizing period, the bottom door of the chamber is opened by hydraulic rams operating suitable pinions and clutch, and the charge of coke is thereby dropped into the hot coke car which runs on rails beneath the ovens and which is propelled by an electric battery tractor.

The skip load of hot coke is withdrawn from the house and placed in a quenching tower, which contains a series of water spray pipes, and which is surmounted by a stack carrying the resulting steam and dust to atmosphere above the retort house roof. The quenching in the tower is automatic, and is effected by the use of a definite quantity of water, after which the skip is drawn into the yard and hoisted by a special transporter, which traverses it to a point over the coke wharf on which the contents of the skip are discharged. On the wharf any necessary further quenching is carried out by a hose, and the coke, which is by this means efficiently quenched with a minimum moisture content, is finally discharged on to a band conveyor and thereby taken to the screening and grading plant.

Gas Offtakes, &c.—Each chamber is fitted at the top with a large gas offtake which may be sealed at will by means of a dish type valve, and which is directly connected to the top gas collecting main. There is also a bottom gas offtake to each chamber connected to a dip pipe which is sealed in a bottom collecting main, the gas from which passes through suitable uptakes into the top main. The top offtakes and collecting main are kept in a moist condition by a series of high-pressure liquor sprays, the liquor and any tar which condenses from the gas being taken to the bottom collecting main, and thence to the tar and liquor separator. The gas passes from the top collecting main through an "Arca" regulator and foul main direct to the condensers.

Every effort has been made to conserve the maximum amount of heat, and to this end the tops and fronts of the settings, as well as the waste gas flues, steam pipes, &c., have been provided with suitable insulating material. A waste-heat boiler has been installed at the top platform level, generating steam from the heat of the waste gases, which are drawn through the boiler and returned to the chimney by a steam turbine and fan.

An electrically-driven lift, capable of dealing with a gross load of 30 cwt., is provided to take skips or passengers from ground level to the various stages. Provision is made for this lift to be used for raising coal and coke to the overhead bunkers in the event of the skip hoist being out of commission.

A messroom with glazed sides has been provided at the

charging level for the convenience of the men operating the plant. A testing room has also been provided for the accommodation of the various control instruments.

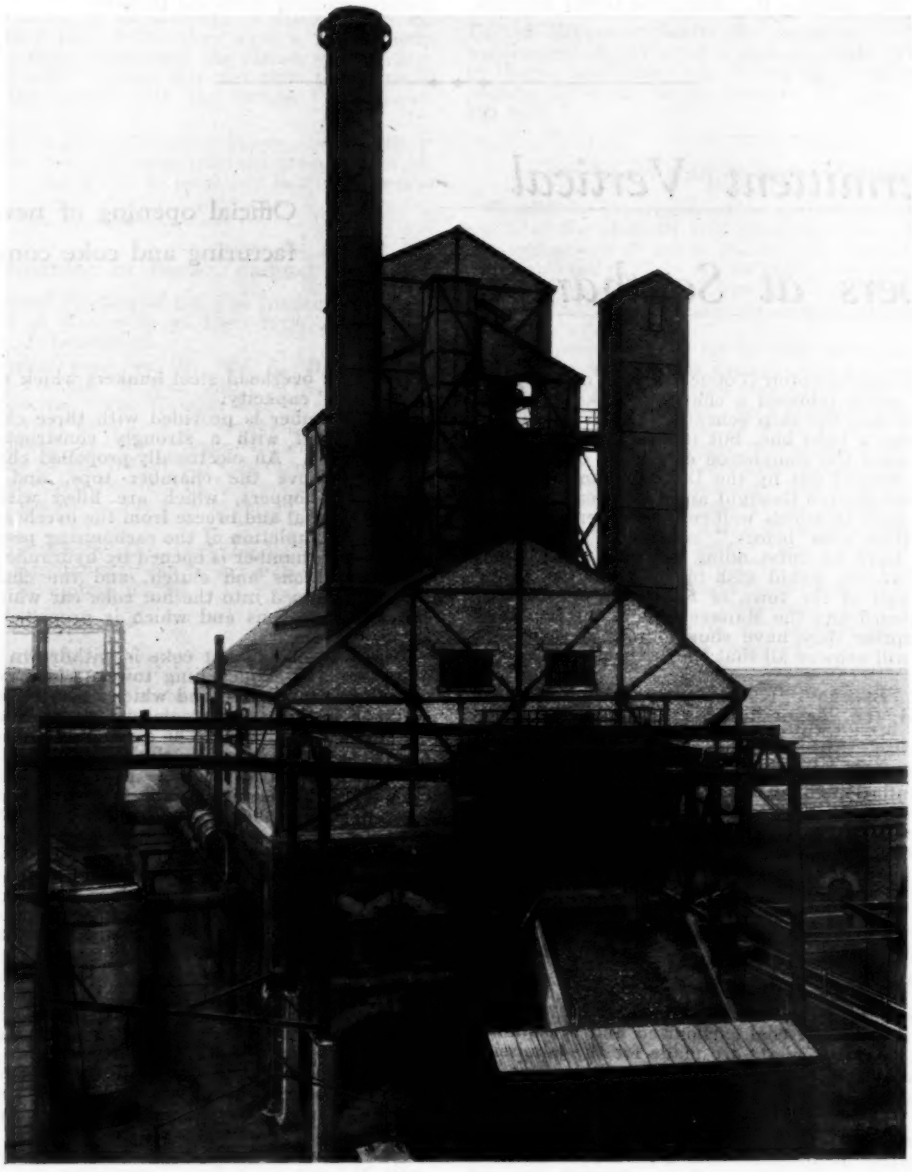
Coke Handling and Grading Plant.

It was apparent at the inception of the scheme for additional carbonizing plant that means would be required for handling the coke produced; also that the existing coke handling plant and coke yard were quite insufficient for the purpose, while being out of date. It was felt, too, that every effort should be made to grade the coke in order to provide customers with a wide range of sizes, and with coke in as dry and clean a condition as possible.

An entirely new coke handling installation was therefore designed and erected on Burnley wharf, the main items of which comprise a set of reinforced concrete bunkers, with a total capacity of 500 tons, surmounted by a complete and up-to-date cutting and screening plant. In conjunction with this, a new coke yard has been set out and paved around the bunkers. Railway sidings have been laid down and extended, and a 40-ton road and rail weighbridge installed in order to expedite still further the loading and despatch of coke.

After quenching outside the retort house, the coke is carried across the road and up to the new plant by a system of belt conveyors erected by the Mitchell Conveyor and Transporter Company. Entering the screening house above the bunkers, the coke drops on to a primary screen of 2-in. mesh. The screened material from this may be passed at will either through a Nelson coke breaker, or into the first compartment of the bunkers, which is reserved for large screened coke.

The screenings below 2 in., together with the material issuing from the breaker, drop on to a belt conveyor and are successively passed over screens of 1¼-in., ¾-in., and ⅜ in. mesh, resulting in the following grades: Large screened coke; large broken coke; small broken coke; nuts; and breeze. These are suitably accommodated in separate compartments of the bunkers.



WOODALL-DUCKHAM VERTICAL INTERMITTENT CHAMBER PLANT AT SOUTHAMPTON.

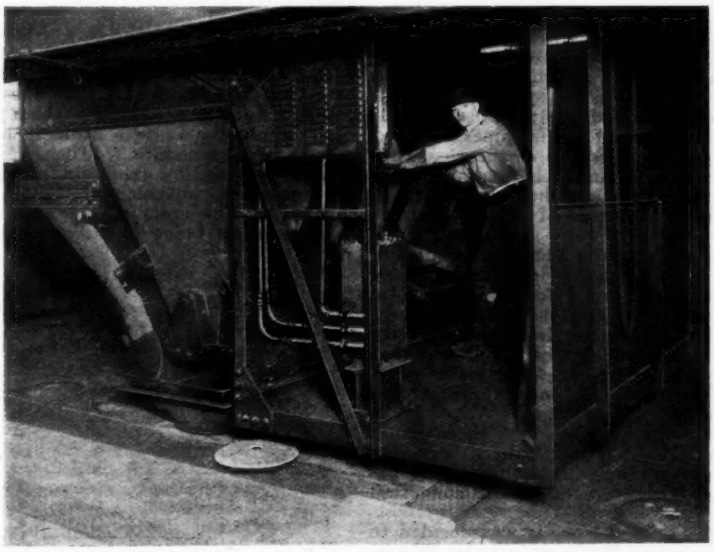
The capacity of the plant is 30 tons of coke per hour, and the screens, which were erected by the Fraser & Chalmers Engineering Works, are of the vibrating type, the screening element being woven wire mesh. The graded coke is discharged from openings in the bottom of the bunkers on to another belt conveyor, which transfers it to a re-screening plant feeding railway wagons or carts. Side openings are also provided, to which it is proposed, at a later date, to fit additional re-screening plant and automatic bagging chutes.

The plant has been designed throughout with a view to

obtaining not only efficient screening, but also maximum flexibility as regards the sizes of coke produced. To this end the breaker is arranged to be adjustable over a wide range, and the screens are so constructed that the screening elements can be replaced, and consequently varied in size of mesh, in a very short time. It is thus possible to ensure the production of a well-screened fuel in such sizes as will best meet the demand at any particular time.

The reinforced concrete bunkers were designed by Messrs. Edmond Coignet, Ltd., and erected by Mr. W. J. Cearns, of Stratford, and the weighbridge is by the Whessoe Foundry and Engineering Company, Ltd., of Darlington.

The chutes, railway sidings, new locomotive shed, boundary wall, &c., have been carried out by the Gas Company by direct labour.



CHARGING CAR

LUNCHEON SPEECHES.

Later, during luncheon at the South-Western Hotel, the Mayor received a silver cigar box as a souvenir of the interesting occasion. His Worship is one of the Auditors of the Company, and in making the presentation on behalf of the Directors, Sir Russell Bencraft humorously observed that he did not know whether the Auditors would pass the item. [Laughter.]

The guests who accepted the invitation of the Company included Mr. G. J. Jackson (Joint Managing Director) and Dr. E. W. Smith (Director), of the Woodall-Duckham Company, Ltd. (the contractors), Mr. T. H. F. Lapthorn, J.P. (Chairman, Portsmouth Gas Company), Mr. T. Hardie (Chief Engineer, Gas Light and Coke Company, London), Mr. S. E. Halliwell (Secretary and Commercial Manager, Bristol Gas Company), Mr. H. C. Head (Managing Director, Winchester Water and Gas Company), Mr. P. G. G. Moon (Engineer and General Manager, Bournemouth Gas and Water Company), Mr. R. Robertson (Engineer, Bristol Gas Company), and Mr. W. Grogono (Engineer, Croydon Gas Company). Mr. T. Carmichael, a Director of the Southampton Company, represented Mr. J. H. Canning, President of the Institution of Gas Engineers.

The Loyal Toast having been honoured, Sir RUSSELL BENCRAFT proposed the toast of "The Mayor and Corporation." As a public utility Company, said the Chairman, the Gas Company desired to acknowledge the pleasant relationship which had always existed between them and the Corporation. Although, in a sense, they were competitors, he felt there was plenty of room in this country for gas and electricity. ["Hear, hear."]

The MAYOR, in reply, said that it was eloquent of the good feeling, as well as of the breadth of mind, of the Board of the Company that on such an occasion, when they were improving their facilities for the public, they should invite the members of the competitive body. The members of the Corporation joined in their celebrations gladly, because they realized that the Company were performing an essential public service in a manner which satisfied the public and which did credit to the reputation and position that the Company enjoyed. The two departments, in friendly rivalry, were rather complementary to each other, and the fact that each existed was calculated to bring the best out in each. He assured the Company that the Corporation possessed nothing but goodwill for them and wished them the maximum of prosperity and continued useful service to the public in the town and district.

The toast of "The Contractors" was proposed by Sir EDWIN PERKINS, C.B.E. (Deputy-Chairman of the Southampton Company). The work, he said, had been completed to the entire satisfaction of the Board of Directors and of the Engineer, who would have the supervision of the plant from that day. First-class work had been displayed in the extension, and that was characteristic of the work of the firm. Sir Edwin also spoke with deep regret of the passing of Sir Arthur Duckham.

Mr. G. J. JACKSON, who replied, sincerely thanked Sir Edwin for his sympathetic references and appreciation of the late Sir Arthur Duckham. In the Gas Industry Sir Arthur was a wonderful enthusiast. It was for all of them in the Industry to pull together. They had a very serious competitor, but the two industries could work together. "But we have to remember that we in the Gas Industry have to fight our battle alone and unaided, while our competitors certainly have a considerable amount of support from the Government, which we, unfortunately, cannot get. If we pull together—if we as the contractors design efficient plant, and if the engineers and the officials who operate it work it efficiently—I am quite sure we shall carry on as we have done in the past." It was very gratifying to them in the Gas Industry that gas company and corporation reports of the last twelve months showed that they had carried on well, and that the companies had continued to pay dividends. To have done this in such a year of depression showed what the Industry was capable of. The slogan of the country was "Buy British," and the plant they had seen that day showed what could be done by a British Company. The plant was British designed, comprised some 4000 tons of British materials, and was constructed and erected by British men. He was pleased to say that the bulk of the labour was recruited from Southampton.

A PROGRESSIVE COMPANY.

The installation of the plant indicated that the Gas Company of Southampton were a progressive body. To spend capital to make improvements at a time like the present showed that the Company had great foresight and hope for the future, not only for their own Company, but for the town. It was very gratifying to the contractors to feel that there were a number of companies to-day who were willing to anticipate the future and build new plant in readiness for the better times that must surely come. It had been a very difficult job to build the plant without upsetting the ordinary process of gas-making, and he acknowledged the great help he had received from Mr. Whitehead, the Engineer, and his staff. He congratulated the Directors of the Company upon having such an efficient man as Engineer.

The toast of "The Chairman" was cordially honoured on the call of Alderman W. BAGSHAW, J.P., who congratulated Sir Russell upon having attained the 74th anniversary of his birth.

In reply, Sir RUSSELL said he was proud to be the Chairman of that great utility Company because he was proud of his colleagues on the Board and exceedingly proud of the staff. Everyone in the Gas Industry knew Mr. J. R. H. Jacobs, the Managing Director, and there was no more popular man in Southampton. He was glad that so high a tribute had been paid to Mr. Whitehead, the Engineer. The Company also had an able Secretary in Mr. Runham. Sir Russell also paid tribute to the whole of the staff. Communications were received daily from customers about the civility shown by the staff, and he was sure the success was due not only to the Board and officials, but to the workmen. "We have a large and loyal staff, and I am proud to be their Chairman," he concluded.

Distribution from Southend to Windsor—1870-1932

An Historic Record of Distribution at High and Medium Pressures in the Area of Supply of the Gas Light and Coke Company*

By H. J. Escreet, B.Sc., Assoc.M.Inst.C.E., Assistant Distributing Engineer, The Gas Light and Coke Company.

(*Continued from p.* 613.)

The mains were laid with steel pipes with welded joints, the pipes being protected by wrapping with hessian impregnated with bitumen, and this system of mainlaying has been adopted in all extensions of the system. In addition to providing an absolutely sound joint, the use of welding allows of the construction of all special pipes required on site from straight pipes, and permits of the easy connection of services (before the main is charged with gas) by welding on sockets. After the main has been charged, service connections are made by means of clips or expanding nipples.

At the time of the amalgamation of the Grays Company with the Gas Light and Coke Company in January, 1930, the high-pressure system had been extended to a total length of 77 miles, and holders had been erected at Stanford-le-Hope (capacity 150,000 c.ft.), and Rayleigh (capacity 440,000 c.ft.) to provide reserve storage for these low-pressure areas. In this way, the high-pressure mains were, to some extent, relieved of the peak loads, these holders being filled at times of low demand and at night. It was the intention of the Grays Company to develop a manufacturing station at Rayleigh, and, with this in view, the low-pressure system supplied from there had been extended and some of the local high-pressure mains converted to low pressure.

Immediately after the amalgamation, it was decided to lay an 8-in. main from Grays to Rayleigh in order to provide additional main capacity for filling the Rayleigh holder and a second link to the existing mains, and this main—a length of 23 miles—was laid between February and October, 1930. Inserted welded joints were used, as it was felt that this type of joint was preferable for larger mains, although the butt-welded joint had been found perfectly satisfactory for mains up to 6 in. diameter.

The mains have been extended during the past two years to supply the villages of Wickford, Ramsden Bellhouse, and Crays Hill, and numerous local extensions to supply newly erected houses and existing houses not previously supplied have been made.

The following table gives the approximate length of main of each size at January, 1930, and the length laid since that date, together with the total length now in service. The principal mains in the system are shown on Plan No. 9:

—	Size of Main and Length in Yards.				Total Length in Miles.
	2 In. and Under.	4 In.	6 In.	8 In.	
January, 1930	71,700	56,000	3400	4,100	77
Laid during 1930-31	39,400	39,500	3800	46,600	73
Mains in service, January, 1932	111,100	95,500	7200	50,700	150

The compressing plant at Grays consists of three sets of reciprocating compressors by the Ingersoll-Rand Company, Ltd., steam driven, the steam cylinders being in tandem with the compressor cylinders. Two sets have a capacity of 25,000 c.ft. per hour each against a pressure of 100 lbs. per sq. in., while the third has a capacity of 30,000 c.ft. per hour at 50 lbs. per sq. in. As the maximum hourly output is now approximately 55,000 c.ft., there is not sufficient stand-by plant to allow of the larger compressor being put out of action for overhaul, and the provision of additional compressors is under consideration.

Relative Costs of High and Low Pressure Systems.

The experience of the past two years has afforded the author an opportunity of making some comparisons between the costs of supplying a thinly populated area like the outer Grays district by the high-pressure system and the low-pressure system, and these figures may be quoted here.

Considering first the cost of local mainlaying, the following table has been prepared showing (*a*) the lengths and sizes of main laid or agreed to for the supply of consumers on the Grays area during the year 1930, and (*b*) the lengths and sizes of mains which would have been required to supply the same consumers had the system of supply been "low-pressure." These "equivalent mains" have been obtained by examining each proposal separately and selecting the suitable size of main for "low-pressure" conditions. The costs of the mains are also set out in the table, these being based on the following costs per yard run:

Size of main	2 in.	4 in.	6 in.	8 in.
Cost per yard	7s. 6d.	12s. 6d.	16s.	21s.

Mains Extensions, 1930.

High-Pressure System.			Equivalent for Low-Pressure System.		
Size of Main.	Length, Yards.	Cost, £	Size of Main.	Length, Yards.	Cost, £
2 in.	30,986	11,620	4 in.	24,250	15,156
4 ,,	18,925	11,828	6 ,,	16,332	13,066
6 ,,	145	116	8 ,,	9,474	9,948
Totals.	50,056	23,564	Totals	50,056	38,170

From this table it will be seen that the cost of these local mains under low-pressure conditions would have been 62 p.ct. above the cost incurred under the high-pressure system.

These mains were laid for the supply of 2576 consumers, and if the average annual consumption per consumer is taken at 15,000 c.ft. or 75 therms (500 B.Th.U. gas), which is about the correct figure for the class of property supplied, the total annual consumption from these mains works out at 193,200 therms. Allowing an annual charge of 8 p.ct. on the capital value of the mains for interest, depreciation and maintenance, the distribution charge per therm is 2·3d. for high-pressure mains and 3·8d. for low-pressure mains.

In order to obtain a true comparison, it is necessary to take into account also the cost of services and, in the case of high pressure, the consumers' governors, since, especially with automatic supplies, it is frequently not possible to recover these costs from the consumer. Allowing £3 apiece for the services and 35s. each for governors, the total costs for 2576 consumers are:

	£
High-pressure, services, and governors	12,236
Low-pressure services only	7,728

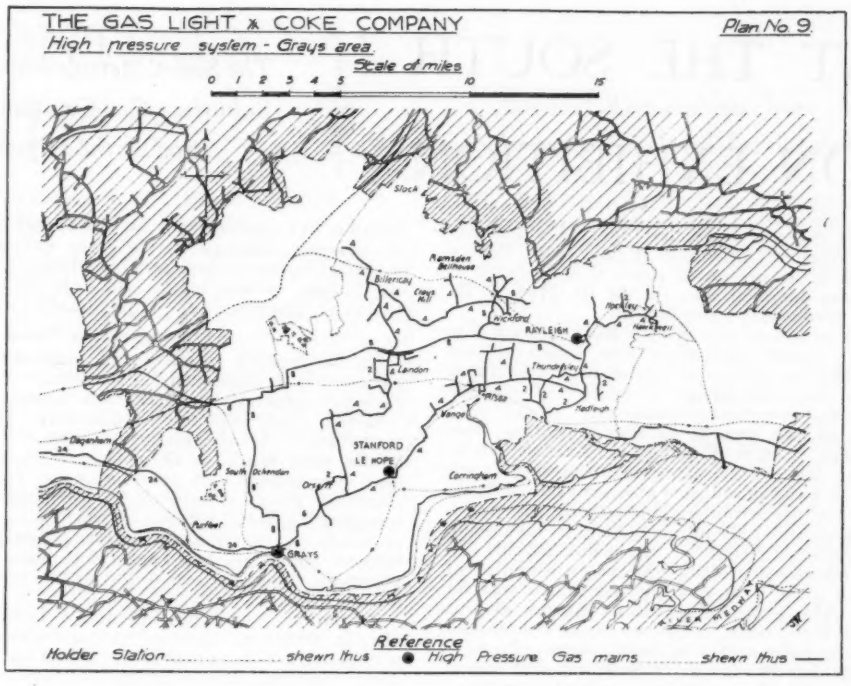
Adding these amounts to the costs of mains, the totals become £35,800 for high-pressure and £45,898 for low-pressure, or annual charges of 3·5d. and 4·5d. per therm respectively.

These charges are based on the assumption that no part of the cost of services and/or governors is recovered from the consumer. The greater the proportion of these costs that can be recovered, the more favourable to the high-pressure system is the comparison.

In the above figures, no account has been taken of the cost of compressing the gas. It is difficult to obtain an accurate figure for this charge in the case of the Grays system, but the author estimates it to be about 0·5d. per therm. This charge should, however, be considered in conjunction with the cost of trunk mains rather than with that of the local mains, since it is necessary to take the gas into the district to be supplied before local distribution can be carried out.

The 8 in. main laid in 1930 from Grays to Rayleigh may

* This account formed the subject of a paper before the London and Southern District Junior Gas Association.



be taken as an illustration of the bearing of high pressure upon the cost of trunk mains. This main was laid at a cost of about 20s. per yard, a total cost of approximately £40,000, and is estimated to have a capacity of 50,000 c.ft. per hour at a pressure drop of 15 lbs. per sq. in. over its whole length. For the same capacity at a pressure drop of 3½ in. water gauge—the maximum allowable under low-pressure conditions—a 24-in. main would have been required, and the cost would have been about £4 10s. per yard. The annual output corresponding to a maximum hourly rate of 50,000 c.ft. may be taken at 100 million c.ft., or 500,000 therms. The annual charge per therm for trunk mains would, therefore, be 1·5d. in the case of the 8-in. main and 6·7d. for the 24-in. main. It is obvious that the pumping charge of 0·5d. per therm under the high-pressure system is of little importance in relation to the saving on the annual charge in respect of trunk mains.

The laying of a 24-in. main of 23 miles in length for a maximum output of 50,000 c.ft. per hour could not, of course, be seriously considered; but if it were decided to use, say, a 12-in. main working at a pressure of 3 to 4 lbs. per sq. in. and distributing to the low-pressure mains through district governors, the annual charge for the main only (at 35s. per yard) would be 2·6d. per therm, and the pumping cost would be at least 0·25d. per therm; so that the total cost per therm for trunk mains and pumping would be 0·85d. in excess of that for the 8 in. main.

Comparing a low-pressure system with 12 in. feeder main with the high-pressure system, the total charges per therm become:

—	Low-Pressure. Pence per Therm.	High-Pressure. Pence per Therm.
Trunk mains	2·6	1·5
Pumping	0·25	0·5
Local mains	3·8	2·3
Services and governors	0·7	1·2
	7·35	5·5

These figures show a saving of nearly 2d. per therm for the high-pressure system.

The author admits that the figures given in this section are only rough approximations, but he considers they are sufficient to show that it is practicable to supply, at a profit, by a high-pressure system many villages which could not be supplied by low-pressure mains except at a substantial loss.

Maintenance.

The use of steel mains, jointed by welding, practically eliminates escapes due to breakage of mains or leaky joints; while escapes due to corrosion of the mains and services show themselves quickly owing to the high pressures.

In order to facilitate repairs, valves are provided at frequent intervals—about 1000 yards apart—on the trunk mains and every branch main is fitted with a valve at its junction with the trunk main. Services are provided with cocks at the connection to the main so that they may be shut off if required.

Several short sections of the original mains which were laid in particularly corrosive soil have had to be re-laid during recent years, owing to corrosion of the steel, but, on the whole, the mains appear to be in good condition.

Separate statistics as to escapes on the high-pressure system are not available, but for the Grays area as a whole, the escapes per mile of main per annum averaged 0·41 for the two years 1930 and 1931, as compared with 2·07 per mile of main for the Company's whole area.

The service governors give little trouble, and generally the consumers obtain a steady pressure throughout the 24 hours, weekday and Sunday—a condition which seldom holds on the outlying parts of a low-pressure system.

(To be continued.)

A "General" Cookery Book.

In response to numerous requests from various parts of the country, Messrs. General Gas Appliances, Ltd., of Guide Bridge, Manchester, have published a comprehensive, yet compact, cookery book, containing a selection of dishes which have been thoroughly tested by the firm's expert in domestic cooking.

Each class of food has been suitably grouped in sections, and, where possible, full consideration to the automatic oven heat regulator has been given. Worthy of special mention is the series of complete dinner menus at the end of the recipes, which have been selected as applying exclusively to particular types of the firm's gas cookers, in the obtaining of the best results with which the quantities and times stated should be strictly adhered to. A full classified index at the end of the book enables any required dish to be found immediately.

The introductory chapters of this cookery book are devoted to particulars of the design and operation of various types of "General" gas cookers, which should prove of great assistance to the housewife in making for more efficient and economical cooking.

The following sections give instructions for the use of gas cookers with two burners in the oven and top flue outlet, and cookers with single burner ovens and bottom flue outlet. The function of the automatic oven heat regulator is simply described, while included also is a chart giving settings and times for general cookery. Details regarding the cleaning of "Governor-General" gas cookers complete the very interesting introductory chapters. It is pointed out that the oven fittings can be taken out with the greatest ease and re-assembled without fear of mistake.

GAS AT THE SOUTH LONDON EXHIBITION

The South Metropolitan and the South Suburban Gas Companies in co-operation at the Crystal Palace

So great was the success of the first South London Exhibition opened by Viscount Burnham at the Crystal Palace last year that high hopes are entertained of the second of the series, which was declared open by the Rt. Hon. J. H. Thomas, M.P., on Wednesday, March 9 last.

On the previous occasion the South Metropolitan Gas Company and the South Suburban Gas Company co-operated on a strikingly attractive stand in a prominent position, and this year the great versatility of gas for domestic purposes was even better displayed.

The stand, one of the largest in the exhibition, was Pagoda-like in design, with 6 ft. gangways from North to South and East to West. Overhanging cornices at each corner, finished with a rim of polished steel, contained floats of indirect burners above ground glass panels, which, together with the pendant and bracket fittings displayed, provided very efficient lighting for the whole stand. In the centre, at the intersection of the gangways, a section of "Sunshine" panel glass with gas burners above was let into the ceiling. The glass, which is to appear at this year's Ideal Home Exhibition, is of an orange colour and sheds a very pleasing light with a distinctly warm effect.

The stand was divided into four main sections—hot water, cooking, laundry, and lighting. In the water heating bay an "Emperor" gas-heated boiler and a multi-point geyser furnished hot water continuously to a bath and wash-basin, with hot towel-rail alongside, in addition to supplying the needs of both cookery and laundry sections of the stand. Other attractive water heaters in white enamel and bronze finishes were displayed, including the "Ascot" and "White Chief" models.

Cooking Section.

On this section cookery demonstrations were staged continuously, a novel feature being that the demonstrators prepared and cooked any dish that the public asked for. A gas-operated refrigerator and "Easiwork" kitchen cabinet were included in this section, while an interesting appliance was a new "Metro" cooker, designed by Dr. Charles Carpenter. The principal feature of this new gas cooking stove is the placing of the oven above the hotplate. This arrangement enables the cook to inspect the progress of cooking without stooping, allows a heavy joint to be inserted into, and removed from, the oven without undue strain, and facilitates cleaning. A draw plate fixed below the oven makes a convenient resting place for dishes. Gas control taps are placed out of reach of mischievous fingers. The hotplate is supported on legs at a height that permits easy cleaning of the floor beneath.

The width of the hotplate can be extended by 8 in. by the addition of extension plates which are supplied at little extra cost.

A number of other attractive cookers in mottled enamel or almost any other coloured finishes desired were on view, including high-grade double-oven types. There was one particularly interesting "Metro" cooker recently produced. This cooker is finished on novel lines. It is enamelled on every part where enamel can be usefully employed, thus reducing the labour of keeping a cooker clean to an absolute minimum; the appearance of the cooker is considerably enhanced by this finish. The outside is smooth and free from everything that might collect grease and dust. The burners, hotplate, and inside shelves are easily removed and it takes only a few minutes to clean the cooker thoroughly.

The oven is fitted with a regulator which makes such operations as baking, roasting, &c., practically automatic. An additional interesting feature is the "flashing by-pass," by means of which the mere act of turning on the tap of any of the hotplate burners causes the burner to light. The principle of the system is embodied in a central by-pass jet in the centre at the back of the hotplate from which small tubes radiate to each burner in such a manner that the gas, when turned on, travels back along the tube to the by-pass flame, is ignited there, and lights back through the tube once more to the burner. Other cookers were fitted with the "Metro" pilot lighter.

The laundry section, on which demonstrations were continuously in progress, contained examples of gas wash-boiler, drying cabinet, and gas irons. The lighting of the stand as a whole was excellent. In addition to the indirect lighting from the cornices, already referred to, similar lighting was applied over the cooker bays, while the display of domestic lighting fittings was extremely attractive—beautiful coloured glass panel pendants, wall brackets, reading lamps, ceiling lamps, &c., all distant controlled by means of "Newbridge" or pneumatic switches.

Attractive Gas Fires.

On the heating side a very comprehensive range of appliances was displayed. Attractive "Metro" fires in various coloured finishes and containing the square "Metro" fuel were side by side with radiators of pleasing appearance. Of the latter, the new "Beacon" radiator, in old gold finish, is of distinctive design. It needs no flue connection and the luminous burner and orange coloured glass window give an appearance of cheery warmth. A large volume of warm air, without any trace of smell, is distributed into the apartment. A boiling burner, which is very useful for many purposes, is conveniently concealed at the top of the radiator by means of a hinged lid.

"Romain" wall heaters and "Indusa" heaters were also in evidence. An interesting feature of the gas fires, which attracted considerable attention, was the "pillar-cock" control, which eliminates bending down to light the fire. Another means of control is the tap let into the wall at hand level. A coke boiler in mottled enamel finish was to be seen, together with gas poker, while the plug-in bayonet attachment for portable appliances was also in evidence.

At night time the stand was brilliantly floodlighted by a series of high-power gas lamps arranged on adjacent balconies above and on either side of the stand, creating a striking effect. Altogether the exhibit was one on which the undertakings concerned are to be congratulated, and it is, perhaps, in some ways a pity that there was no electricity display at the exhibition, so that gas might score by comparison. However, we understand that this is to be remedied next year. The stand was efficiently staffed by nine attendants and four demonstrators (two cookery, one ironing, and one washing), and good business has materialized as a result of the exhibition.

The exhibition as a whole is to be officially closed this week, but by special arrangement with Sir Henry Buckland, General Manager of the Crystal Palace, the South Metropolitan and South Suburban Gas Companies' stand is to remain over Easter, when it is anticipated that a large number of visitors will have the opportunity of inspecting it. The stand is to be staffed from 10 a.m. till 10 p.m. on both Easter Saturday and the Bank Holiday, and a very valuable piece of propaganda will thereby be achieved by the undertakings.

Gas at the South London Exhibition, however, is by no means finished with when the main exhibit has been described. Two large replicas of the Marble Arch drew the public's further attention to gas. These erections, 20 ft. or more in height, and broad in proportion, bore gas slogans and were efficiently illuminated by panel lights.

At either end of the exhibition were rest rooms equipped by the gas undertakings. Here visitors were invited to "Rest in Comfort," while at the same time they were warmed by an attractive modern "Metro" gas fire.

All-Gas Bungalow.

A model bungalow was fully equipped with "Metro" gas service. Lighting throughout was by attractive gas fittings, while "Metro" fires in various finishes to match the colour scheme were in every room. Cooker, gas copper, and sink heater in the kitchen and geyser in the bathroom completed the appliances. Close by was a small garage showing the application of the safety gas heater for this type of work.

A large number of other firms exhibiting at the Palace were using gas appliances on their stands, while among firms actually exhibiting gas apparatus was the Economic Household Appliance Company, Ltd., of Queen Anne Road, E. 9. This firm were showing their "Ekonomik" gas kitchener, which is a combined gas fire and cooker operated by the one central gas fire, which heats two ovens, grills, boils six 6-pint utensils, and heats the room if desired. The whole stove (including doors) is lined with asbestos to conserve the heat, and the apparatus can be obtained in all-black or grey mottled enamel finishes. Smaller models with only one oven are also supplied.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

DETERMINATION OF THE HEAT OF POST-CARBONIZATION OF COKE.

H. Brückner and W. Ludewig, in "Brennstoff-Chemie," 1932, 13, 85-88 (March 1), make use of the data given by Bunte and Ludewig (see "JOURNAL," Nov. 4, 1931, p. 308) and calculate the heat change involved if further carbonization of coke to temperatures of 900°, 1000°, 1100°, and 1200° C. is carried out. The previous data related to a series of ten cokes and gave the loss of weight, the original and final calorific values, and the amount and composition of the gases evolved when the cokes were heated to various temperatures beyond the temperature of manufacture.

If C	= calorific value of the dry ash free coke as made [calories per gramme].
C_1	= calorific value of the dry ash free coke after further heating to T° C. [calories per gramme].
W grammes	= loss of weight per gramme of dry ash free coke as a result of the further heating.
X, Y, Z grammes	= the respective weights of CO, H_2, and CH_4 evolved per gramme of dry ash free coke.
x, y, z	= the respective calorific values of CO, H_2, and CH_4 [calories per gramme].

Then the heat of post-carbonization is given by the expression

$$[(1 - W)C_1 + Xx + Yy + Zz] - C.$$

In general, the heat of post-carbonization is negative, *i.e.*, the yield of available heat units in the solid, liquid, and gaseous products of carbonization is reduced if the final temperature of the coke is increased.

If the figures for the heats of post-carbonization at 1000° C. are compared for the series of cokes investigated, it is found that they come in approximately the same sequence as the figures for the percentage reduction in the content of combustible sulphur occurring as a result of the heating. The figures for the ten cokes investigated were as follows:

Heat of post-carbonization [cals. per gramme]—										
To 900° C.	−119		− 20		−68	−30				
To 1000° C.	−163	− 74	−72	− 65	−51	−42	−34	−31	−17	+99
To 1100° C.	−179	−101	−48	− 80	−39	−65	−45	−25	−11	+29
To 1200° C.	−222	−149	−21	−116	−19	−41	−37	−18	− 4	+17
P.ct. reduction in combustible sulphur	12	20	10	11	23	35	35	29	45	52

The heats of post-carbonization to successive temperatures of 900°, 1000°, 1100°, and 1200° C., for different cokes, do not necessarily show progressive uniform changes, since the values may show rises and falls or rises only or falls only.

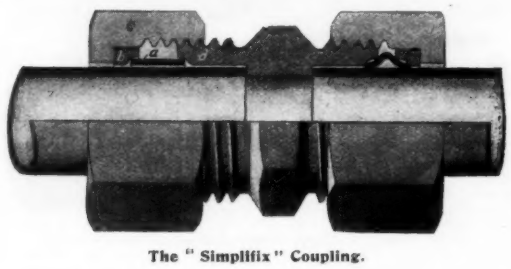
[*Note by Abstractor.—The values reported do not necessarily indicate accurately the true trend of the variation of the heats of post-carbonization with temperature, since the calorific value determinations were not made with the intention that the results should be employed for the purpose to which they have now been put, and hence, probably, the determinations were carried out only with ordinary care and not in triplicate, though the latter course would have been preferable in an* ad hoc *investigation of the phenomenon of post-carbonization in view of the small changes in calorific value involved.*]

NOTES ON PLANT AND PROCESSES

A New Pipe Joint.

Any form of tube joint designed to replace screwed joints must not only be adaptable to as wide a range as screwing, but must also be competitive when the complete costs of fitting are taken into account.

The "Simplifix" coupling calls for attention on account of its simplicity and wide utility. This coupling is applicable to tubes of any material, including welded steam, gas, and water barrel, thin solid drawn steel tubes, copper and brass, lead piping, and even glass and porcelain tubes. The joints can be made, broken, and re-made as frequently as desired, without detriment to the ultimate joint; and no heat treatment or mechanical work on the tube is involved, beyond cutting to the required length.



The "Simplifix" Coupling.

The principle involved is that of compressing on to the periphery of the tube a sealing ring, which can usually be of the same metal as the tube itself if required, and then clamping that ring between the sealing faces of a coupling nut and spigot. The construction of the coupling is shown in the accompanying sectional view. A sealing ring or sleeve *a* is provided large enough to accommodate considerable variations in diameter and surface irregularities on the tube, and this is assembled in the union nut *c* with an internally coned compressing ring *b*. The end of the spigot *d* is similarly coned, so that when the union nut is screwed up, the sealing ring is compressed into a cone which fits tightly on to the tube and also seals the union joint.

Small discrepancies in the length of the tube do not affect the joint, for though normally the tube is pushed into the assembled coupling until it abuts against the centering shoulder, no attempt is made to form a tight joint at that point. Further, no tools whatever are required beyond a hacksaw for cutting off the tube and a spanner for tightening the union nut.

There is no pressure on the extreme end of the tube, and no reduction whatever in the thickness of the metal, such as occurs by screwing or belling the end. The pressure required to make the seal is distributed perfectly evenly round the complete periphery of the tube under the sealing ring, thus obviating collapse or distortion by irregular pressure. The point of pressure is, in fact, as strong as, or stronger than, the body of the tube.

The joint can be re-assembled in any position after being broken, and a perfect re-seal made. Any tendency to leak after assembly or reassembly can be corrected at individual joints by further tightening the nut.

For steam, water, or gas piping systems, intricate assemblies involving numerous joints can be made with ease in little time and with great accuracy. The joint is in no sense dependent upon jointing solutions, compositions, or packings other than the metallic sealing ring. Sections of pipe line can be replaced, repairs executed, and alterations made in positions and under conditions which would raise great difficulties with screwed fittings.

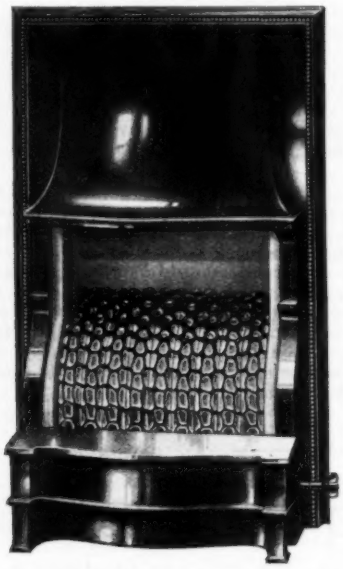
Numerous tests have shown that the couplings are stronger than the body of the pipe, even against end pressure which might be considered likely to draw the pipe from the coupling. In one test made by the National Physical Laboratory on a steel coupling intended for oil injection work on a Diesel engine, 12 tons per sq. in. pressure was exerted without any weakness developing. In another test at the same institution a copper tube, ½ in. bore by 19 w.g. was closed at one end by a double "Simplifix" coupling and tested to over 2 tons per sq. in. The tube ultimately burst at 2·06 tons per sq. in. at a position where it had been softened by brazing on the pump connection. The unheated portion and the coupling remained perfect.

The coupling can be made as an integral part of almost any type of valve, cock, or fitting which normally employs screwed, flanged, or coned connection. Further, a simple

adaptor is made for converting the standard type of fitting to a " Simplifix " coupling. The sizes made at present range from $\frac{1}{8}$th outside diameter tube to $2\frac{1}{2}$ in. inside diameter, in steel, brass, or other metals, as required. The makers and patentees are Simplifix Patents, Ltd., 60, Victoria Road, Surbiton, Surrey.

Wilsons' New " Sunbeam Major."

Many visitors to the British Industries Fair were no doubt struck by the beauty of Wilsons' new design of " Sunbeam " which they call the " Sunbeam Major." This is a " Sunbeam " gas fire built into a standard frame, having a flue-outlet at the back. While all the " Sunbeam " characteristics have been retained, and in particular, the pleasing appearance of the actual firefront, which resembles a brightly burning coal fire, the design of the fire itself is particularly happy.



The fire shown on the stand at the Fair was finished in Wilsons' new pearl green, a very delightful colour, which seems to receive an added effectiveness from the tiny border resembling an edging of small pearls.

Gas Cookers for 1932.

The planning of the modern kitchen calls for the introduction of furnishings and equipment which will make it both attractive to the eye and easy to work. The gas cookers described and illustrated by Messrs. R. & A. Main, Ltd., of Gothic Works, Falkirk, in their new season's catalogue, just issued, fulfil both these requirements, and from the æsthetic standpoint alone are worthy of the finest kitchen settings.

The introduction of " Mainamel " gas cookers in 1927 set a standard in finishes which, it is claimed, had never before been attempted. To-day, as the result of incessant research, many further improvements are embodied. But appearance is not their sole recommendation. To the users they are appliances of strong build, doing their work with efficiency and effectiveness, and safeguarding, by means of their patent " Conservor " oven and " Mainstat " automatic control, the cooking as well as the gas bill.

To gas undertakings " Mainamel " cookers represent sound value and the utmost satisfaction in maintenance which their standardized system of construction with full interchangeability of parts can offer.

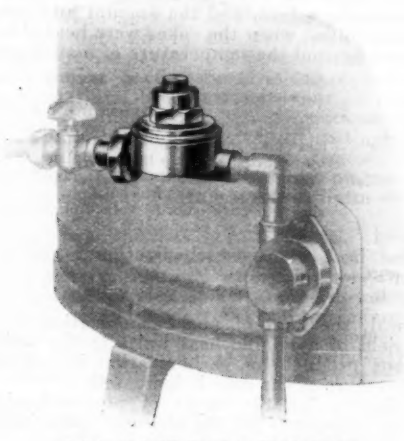
Attention is drawn in the catalogue to the " Thermomain " oven-heat indicator, which is fitted on the oven door and shows at a glance the internal temperature of the oven during the progress of cooking. The functions of the " Conservor " oven and " Mainstat " automatic cooking control are also explained. Following are illustrations and specifications of various types of cooker in enamel and black finishes, including the " Maintop " high-grade cooker; also various designs of hotplates; double-oven ranges; together with a number of other appliances such as grillers, the " Mainspear " gas poker, gas rings, baking plates, and wash-boilers.

In connection with the publication of the new season's cooker catalogue Messrs. R. & A. Main, Ltd., announce that the heavy type of hot-stamped brasswork supplied on their highest grade cookers in recent years will, during the coming season, be extended to the " Mainservor " mottled " Mainamel " finish cookers, and will include locking taps to the oven supply.

The " Maintenance " mottled " Mainamel " series will be fitted with hot-stamped taps of stainless finish and handles of black bakelite, thus bringing them into line with the " Deluxe Mainamel " cookers.

Wright's " P.C." Gas Cut-Off Valve.

A particularly serviceable invention has just been put on the market by Messrs. John Wright & Co. (Radiation, Ltd., Proprietors). This is a most ingenious cut-off gas valve which has been patented by Messrs. Wright, and is designed to be attached directly to gas appliances—in con-



Safety Cut-Off fitted to Wash-Boiler.

junction with either ordinary or prepayment meter—which have a full-on consumption of not exceeding 25 c.ft. per hour. This should be of great service, as the valve has a wide application in general use.

Should a consumer overlook the fact that the tap of his gas appliance is open when the prepayment meter cuts off the supply, all possibility of the escape of unburned gas is obviated by this ingenious little valve, which automatically shuts off the supply and does not allow it to be renewed until the user lifts the valve, when it is again ready to " keep its watch," as before.

The " P.C." Valve.

The valve is made from heavy hot stampings, and we understand that the mechanism is simple and likely to have a long and useful life.

The makers advise us that supplies of this valve are now available at a most reasonable price.

The " No. 244 Calthorpe Cooker."

The Parkinson Stove Company, Ltd., exhibited at the British Industries Fair a new cooker which was described as the No. 52 cooker, and was illustrated in our columns last week. The firm now intimate that this was a temporary works number, and that the cooker will in future be known as their " No. 244 Calthorpe cooker."

THE "JOURNAL" TECHNICAL RECORD

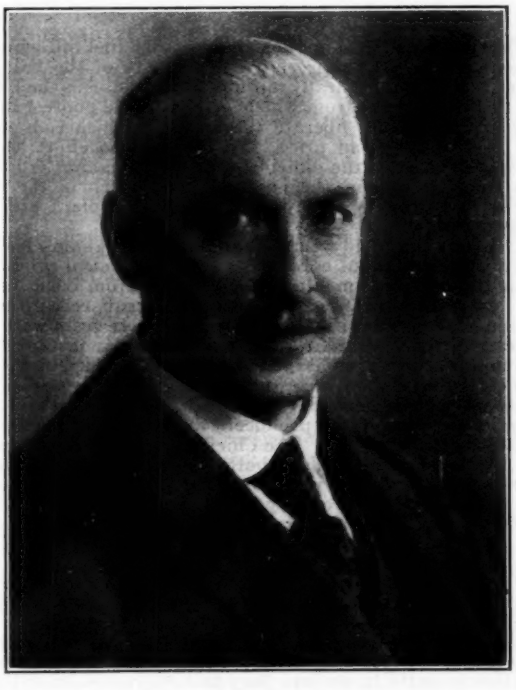
Which contains Reports of Meetings of Gas and Allied Associations

Midland Association of Gas Engineers & Managers

Presidential Address of Mr. E. B. Tomlinson, M.Inst.C.E., of Birmingham

The Annual General Meeting of the Association was held on Thursday of last week, in the Grand Hotel, Birmingham; the chair at the outset of the proceedings being occupied by Mr. H. J. Woodfine, of Wellington (Salop), the outgoing President, and subsequently by the new President, Mr. E. B. Tomlinson, Engineer-in-Chief to the City of Birmingham Gas Department.

The PRESIDENT referred to the loss that had been sustained by the death of Mr. Fred Lee, of Hinckley, who was an old and greatly valued member of the Association. Those who knew him at all well would, said Mr. Woodfine, agree that he possessed a most lovable disposition. He was an able engineer and an excellent gas administrator, and his loss would be most severely felt.



THE PRESIDENT.

E. B. TOMLINSON, Birmingham.

Mr. Tomlinson received his early training with Messrs. C. & W. Walker, Ltd., of Donnington, Salop, where he spent eight years in their constructional shops and drawing office. He was then for two years with Messrs. Robert Dempster & Sons, Ltd., of Elland, as Leading Draughtsman, and in 1897 obtained the position of Chief Draughtsman at the Windsor Street Works of the Birmingham Corporation Gas Department under the late Mr Charles Hunt. In 1902 Mr. Tomlinson was appointed as Superintendent at the Adderley Street Works under the late Mr. Henry Hack, these works having an annual make of about 500 million c.ft. In 1907 he was appointed Works Engineer at the Windsor Street Works, which at that time had an annual capacity of 1750 million c.ft. In 1915 he was appointed Engineer at Nechells Works, which had an annual capacity of 2000 million c.ft. In 1929 he was appointed Engineer-in-Chief to the City of Birmingham Gas Department, the annual output being nearly 15,000 million c.ft.

The members stood silently as a mark of respect.

Thereafter the report and accounts were unanimously adopted.

Mr. HAROLD DAVIES, of Chesterfield, as Chairman, presented the annual report of the Midland Commercial Gas Association, the membership roll of which, he said, numbered seventy. It was hoped that those at present outside would come in. Many matters had been discussed during the past year—the biggest, perhaps, being the question of the disposal of surplus coke. They had not yet brought this to a final conclusion, but they believed they were on the right lines. The use of gas for industrial purposes and central heating had also claimed attention.

Mr. R. S. RAMSDEN (Leamington) seconded the adoption of the report (which was agreed to) with the remark that a bigger attendance at the meetings would be appreciated.

Mr. F. C. BRIGGS (Dudley) submitted the report of the Midland District Education Committee, which, he said, had done useful work during the past year. They had been able to help quite a number of students to get on the right lines. Local Committees had had a very valuable influence on the working of the scheme.

The adoption of the report was seconded by the PRESIDENT, and agreed to; and then Mr. Tomlinson was appointed representative of the Association on the Institution Council.

The following were appointed to represent the Association on the Midland District Education Committee: Messrs. E. B. Tomlinson, F. C. Briggs, W. G. S. Cranmer, and T. H. Poulson.

MEMBERSHIP ROLL.

The under-mentioned new members were elected: Mr. Henry S. Adams, Engineer and Manager, Gas-Works, Bilston; Mr. William R. Day, Engineer and Manager, Gas-Works, Banbury; Mr. William C. Pinkney, Engineer, Gas-Works, Swan Village, Birmingham.

The PRESIDENT said the Committee had considered it a fitting thing that an intimation should be sent to Mr. John Wilkinson, of Nottingham, of their wish that he should allow his name to go forward as an honorary member of the Association. Mr. Wilkinson had replied thanking the members for their kindly thought. He therefore proposed Mr. Wilkinson as an honorary member.

Mr. P. N. LANGFORD (Coventry) seconded this, and it was unanimously agreed to.

THE NEW PRESIDENT.

Mr. WOODFINE, in asking the new President to take the chair, remarked upon the proud connection of the Association with Birmingham. He pointed out that the late Mr. Charles Hunt was the first President.

Mr. TOMLINSON (who was received with applause) thanked the members for their cordial reception, and then proposed a hearty vote of thanks to Mr. Woodfine, to whom, he said, they were greatly indebted for his conduct in the Presidential Chair. Mr. Woodfine was a man who did things thoroughly. The members had greatly enjoyed their visit to Wellington, and had learned much from it. He handed to Mr. Woodfine the Past-President's badge.

Mr. JAMES PATERSON (Cheltenham) seconded the vote, and referred to the extremely practical character of Mr. Woodfine's address a year ago.

Mr. WOODFINE briefly acknowledged the vote, which was accorded in a cordial manner.

PRESIDENTIAL ADDRESS

of Mr. E. B. TOMLINSON, M.Inst.C.E., Engineer-in-Chief to the City of Birmingham Gas Department.

Will you first allow me to repeat my sincere thanks and appreciation for the honour you have conferred upon me in appointing me as your President. I will, as far as in me lies, do my utmost to maintain the high standard attained by Past-Presidents of this Association.

For the past few years the Gas Industry has been striving to reduce the price of the therm in the face of big difficul-

ties, notably the cost of coal, general industrial depression, and the tremendous fall in revenue from residuals. The stage has passed when increased gas consumptions were semi-automatic, and now increased business can only be obtained by giving a definite economy over other forms of energy. It is therefore incumbent on the Gas Industry, in the face of competition, and in an effort to aid the revival of British industry generally, to strive still harder to reduce the cost of the therm to the consumer.

I intend therefore to direct my remarks to the question of

How to Deliver the Cheapest Therm to the Consumer.

The selling price of gas is dependent upon the total costs incurred in delivering gas to consumers, and includes costs of manufacture and distribution together with standing and capital charges. The cheapest therm from the manufacturing point of view is usually one of a lower calorific value than straight coal gas, and is generally of a high specific gravity, which, with the increased quantity to be delivered per therm, involves higher distribution costs; on the other hand, lowest distribution costs are usually associated with high calorific values. These considerations usually confine the declared calorific value within the limits of 425 to 560 B.Th.U. gross per c.ft.; hence every gas undertaking must strike the economic mean to suit its own peculiar circumstances.

With a view to reducing the selling price of gas let us first consider *the possibilities with the existing carbonizing plant if the declared calorific value is unchanged.* In these circumstances any economies in production are likely to have little effect on distribution costs. The question of whether a cheaper therm may be delivered by altering the declared calorific value with all its attendant modifications to works and district administration and appliances will be dealt with at a later stage in this address. The principal items which invite investigation in a campaign for cheaper production, without re-declaring the calorific value, may be enumerated as follows:

(1) Coal.
(2) Fuel.
(3) Saleable residuals.
(4) Carbonizing.
(5) Auxiliary gas-making plant.

Coal.

The coal delivered to a gas-works must have satisfactory gas-making and coking qualities. These qualities are inherent in the respective coals, but improvements may be effected by reducing the extraneous ash and moisture, screening to suitable sizes, and in some cases mixing with coal of a lower caking index.

The importance of low ash content in the coal has been stressed so often that it is unnecessary to enumerate the advantages and direct pecuniary saving obtained by buying clean coal. The amount of ash in the coal received should be constantly watched. Quite apart from periodical laboratory tests for ash, the daily practice of taking a truck of coal on large works (and, of course, less frequently on smaller works) and passing the contents over a slowly moving picking belt where the pickable bats are removed, proves to be an admirable way of keeping the coals delivered of uniformly low ash content. The bats picked out demonstrate in a very practical way the thoroughness or otherwise of the cleaning at the colliery.

Excessive moisture in coal, though less serious, has the disadvantage of increased cost on a dry basis, increased freight charges, and more heat required for carbonization. These disadvantages which apply chiefly to washed coals, and are usually accompanied by the somewhat compensating advantages of clean coal, can be overcome by drying at the colliery or by dry cleaning instead of washing. It is hoped that dry cleaning of coal will become a more regular practice and that gas engineers will fully appreciate its advantages.

The question of coal size is of great importance and must be carefully considered in conjunction with the plant available. Certain types of plants are more suitable for dealing with the smaller sizes than others. Horizontal retorts and modern intermittent vertical retorts with auxiliary bottom gas offtakes are suited to almost any type of gas coal. Continuous verticals will deal with nearly all coals, but are not too well suited for highly caking coals containing a large proportion of fines.

Having insisted upon a satisfactory gas making and coking coal with the lowest possible ash and moisture content, and in some cases having made conditions as to size, the only other consideration is cost, or more exactly the net cost of coal after allowing for the return from residuals. Three possible ways suggest themselves for reducing the net cost of coal, still remembering that no alteration in calorific value is to be made:

(1) The purchase of cheaper coals.
(2) Increasing the revenue from residuals.
(3) The use of less coal for the same thermal yield.

(1) Probably every gas engineer will assert that he is buying the cheapest coals, taking into account yields of various products and freight charges, which will suit his purpose, but it may be advisable to consider whether some cheaper coals, hitherto considered as unsuitable, cannot be made suitable. For instance, are there any cheap gas-making slacks available? Judicious mixing of such slacks with standard coals may, if the plant is sufficiently adaptable, show a saving on the cost of the therm. On the other hand, with a different type of plant, it may pay to buy graded nuts, if a more than equivalent saving can be effected by increased gaseous yields and a higher quality (or quantity) of residuals. Again, if highly caking coals are being used it may be possible to admix a small percentage of non-caking gas-making coals, which will probably improve the porosity and activity of the coke and overcome bottom pressure in vertical retorts.

(2) The possibility of increasing revenue from residuals will be discussed under the heading of "Residuals."

(3) The use of less coal for the same thermal yield can only be achieved by increasing the yield of gaseous therms per ton; such increase may be made in two ways: (*a*) By increased efficiency of straight carbonizing; (*b*) by extra steaming of the charge, but this must not reduce the value of the coke by a greater amount than the value of the increased gaseous therms.

Fuel.

Every gas undertaking has an enormous fuel bill which is often insufficiently appreciated in a study of the balance-sheet. It must naturally be our aim to use as fuel that portion of our coke from which we obtain the poorest financial return, and so liberate the material which commands the best market and price. To this end no effort should be spared to solve the difficult problem of making producer gas from coke fines, the percentage of which in the coke varies greatly with the type of carbonizing plant and the class of coal used.

It is now quite 16 years since the Birmingham Gas Department carried out careful tests on mechanical producers with the object of making producer gas from coke dust—*i.e.*, everything passing through a $\frac{1}{16}$ in. square wire mesh screen—for heating retorts or ovens. These tests were not successful; still the matter has never been far distant from the minds of those in charge of the various works. Although the calorific value of such fuel is good, efficient gasification presents several practical difficulties, the chief of which is erratic working of the producers due to the physical properties of the material. The Chief Engineer at Manchester, Mr. Alfred L. Holton, has, both at Bradford Road and at Partington, secured a very considerable measure of success by the use of comparatively small material in Trefois producers. The results of his investigations are embodied in an admirable joint paper with Mr. H. C. Applebee given to the Manchester District Association on Oct. 10, 1930—see "Journal" for Oct. 15, 1930, p. 151. Recent experiments elsewhere have been conducted in a further effort to gasify the coke fines in a high-pressure producer (without a water seal grate), but the results have not been too promising. I was most interested when visiting the Fuel Research Station recently to see how they had converted an ordinary blue water gas plant into a producer for dealing with this material. This latter experiment had been running for some weeks, and the Gas Industry will look forward with eagerness to the detailed results of this investigation.

Closely allied to the question of fuel is the question of the transference of heat from the fuel to the coal being carbonized. If the heat conductivity of the retort walls can be increased, without sacrificing the strength and rigidity of the setting or the life of the refractories, the fuel bill may be reduced. I think this is a matter which would well repay continued investigation by the Institution of Gas Engineers Refractories Committee.

The question of heat input into the charge and the investigations of the Fuel Research Board will be dealt with under the heading of "Carbonizing."

Fuel economy is, of course, indirectly attained by the recovery of waste heat from retort settings by steam generation. This form of economy is seldom neglected on a modern works, but it is well to see that the efficiency of such plant is rigidly maintained.

Saleable Residuals—Coke.

The possibility of increasing the return from coke by using as fuel that portion of the coke which commands the lowest price, and by strict attention to efficient utilization

and conservation of the heat generated from fuel, has already been discussed. There still remain, however, avenues for increased revenue in the actual production and marketing of coke.

As far as production is concerned the aim should be toward uniform coke quality and perfect grading of the sizes. The uniformity of coke from a particular plant depends primarily on two factors—the type and size of the coal carbonized. As most works have to handle a number of different coals, each producing perhaps a distinct type of coke, the maintenance of an even coke quality depends on even mixing of the coals. With erratic deliveries of coal from various collieries, mixing presents considerable difficulties, but all reasonably possible steps should be taken to ensure coal mixtures being fairly uniform.

With large undertakings, necessarily drawing upon a large number of collieries for coal supplies, it seems inevitable that occasional complaints arise with respect to variation of coke quality. It is worthy of mention, however, that at one of the Birmingham Works where coal mixing hoppers of 2000 tons capacity are installed and the various coals are divided into four classes and afterwards proportionately mixed, coke complaints are very infrequent.

Coal size is another aspect of the problem, sometimes affecting coke quality, particularly on continuous verticals. Generally speaking, in such retorts fine coal produces denser and larger coke than larger coal of the same quality. It is therefore advisable to aim at a uniform flow of coal, as regards percentage of fines, into the retorts. Unfortunately, however, a uniform flow of coal from the crushers may not ensure a uniform flow into the retorts owing to the intervening action of segregation in the coal bunkers.

Tar.

It is unfortunate that the revenue from tar has steadily declined during the past few years, and the disposal of the creosote fraction has become difficult. Much work has been done by the Joint Research Committee of the Institution of Gas Engineers and Leeds University on the use of creosote for carburetted water gas manufacture, but their conclusions do not offer much encouragement for the disposal of creosote in this manner.

It is more than ever important that all those who engage in preparation of tar for road purposes should do their utmost to maintain the present demand and also by constant attention further improve this excellent binder for road construction and surfacing.

Benzole.

Benzole recovery, as a profitable process, has received much prominence during the past few years, and a consideration of the possibilities of supplying a cheaper therm would not be complete without investigating the economic aspect of this question.

As to whether benzole recovery will be profitable depends among other factors on:

(1) The type of carbonizing plant.
(2) The declared calorific value.
(3) The cost of replacing the therms extracted from the gas.
(4) The cost of extraction and treatment.
(5) The market value of the recovered spirit.

1. *The Type of Carbonizing Plant.*

The method of carbonizing has an important influence on the quality of the crude benzole recoverable. With intermittent systems of carbonization, the recovered spirit usually contains a high percentage of benzene, and rectification to conform with existing benzole specifications is neither costly nor wasteful.

Gas from continuous verticals contains considerable quantities of "uncracked" or "semi-cracked" primary distillation products, and consequently the crude benzole from such gas contains high percentages of "unsaturated" and paraffin hydrocarbons.

2. *The Declared Calorific Value.*

The extraction of benzole from coal gas causes a reduction in calorific value of about 25-30 B.Th.U. per c.ft. It is evident, therefore, that if the declared value is to be unchanged, some modification to the gas making process is required.

If the declared calorific value of a town's gas were, say, 560 B.Th.U. per c.ft.—that of a straight coal gas—then benzole recovery would necessitate enriching the stripped gas with a very rich carburetted water gas, but the production of such high quality carburetted water gas can readily be shown to be uneconomic. Most undertakings, however, declare calorific values within the range of 425 to 525 B.Th.U. per c.ft. This generally implies that coal gas has been diluted with water gas, produced either in the retorts or in an outside plant. To recover benzole and still distribute gas of the same declared value as previously, can be done either by using less diluent blue water gas (thus making a greater quantity of coal gas of high calorific value, and depending upon the extraction of benzole for reduction to the declared value), or by making up any deficiency in calorific value with carburetted water gas of suitable quality. Of course, it may be advisable, when adopting benzole recovery, to re-declare the calorific value at a lower figure, but this aspect will be fully considered when the general question of "Declared Calorific Value" is discussed later. It may be mentioned that the extraction of benzole, while reducing the calorific value also reduces the specific gravity of the gas, so that the distribution of stripped gas does not present the same difficulties as are experienced when calorific value is reduced by other means.

3. *The Cost of Replacing the Therms Extracted from the Gas.*

This factor depends upon how the therms are replaced, whether by an increased amount of coal gas with less blue water gas (however made) or by carburetted water gas. A clearer appreciation of this point will be possible when calorific value in relation to various types of carbonizing plant is considered later.

4. *The Cost of Benzole Extraction.*

The actual cost per gallon of producing saleable benzole from the gas depends on the quality of the benzole vapours in the gas and on the method of extraction, whether by oil washing or by activated carbon adsorption. All available data point to the recovery and refining from horizontal or intermittent vertical gas being a paying proposition under to-day's conditions. On the other hand the cost of producing motor spirit from continuous vertical gas is greater owing to the altered quality of the spirit and increased refining losses.

5. *The Market Value of the Benzole Recovered.*

This again will depend upon the quality of the spirit and also on whether the process will be continued throughout the year or whether it will be subject to shutting down during the winter months. One can hardly expect as good a price for an intermittent supply of benzole as for a continuous one.

Having enumerated and discussed the above factors, the case for benzole recovery from gas from intermittent systems of carbonization (if the declared calorific value is not over, say, 535) appears to be more favourable than from continuous vertical gas.

This conclusion is emphasized by the fact that while benzole recovery is practised by several British undertakings, in nearly all cases their gas-making plant appears to be of an intermittent type.

Carbonizing.

Under this heading it is only proposed to deal with *high-temperature carbonization generally*. The varying qualities which it is possible or economical to make on different types of plant will be left for consideration under a later heading of "Declared Calorific Value."

Efforts to reduce carbonizing costs should be directed towards four factors, on which primarily depends the cost of making therms in the retort house. These factors are:

(1) Thermal yield of gas per ton.
(2) Thermal yield of gas per retort per day.
(3) Fuel consumption per therm of gas made.
(This has already been dealt with under the heading of "Fuel.")
(4) Labour costs per therm of gas made.

It is very improbable that any set of conditions will give maximum yield per ton and per retort per day with minimum fuel and labour costs, so that the most economical balance must be secured.

It is often possible, by prolonging the carbonizing period, to obtain an increased yield of gas (largely hydrogen) beyond that corresponding to a volatile matter content of 1 to 1·5 p.ct. in the coke, but such a practice may involve more than equivalent increases in fuel and labour costs and depreciation of the free burning qualities of the coke.

While a large make of therms per ton is universally desired, it is very necessary that the therms produced per retort per day should receive full attention, and the balance of these two factors secured which will result in the cheapest therm. Often it is advantageous to increase the therms per retort per day at a slight expense of the thermal yield per ton; the extent to which this can be done can only be determined by experiment and in the light of the full facts relative to the individual installation under consideration—

quite frequently the amount of producer gas procurable is a limiting factor.

The advantages to be obtained by increasing the thermal yield per retort per day are:

(1) Less plant and consequently less capital required for the same total make of therms.
(2) Lower labour costs—varying with the type of carbonizing plant.

With intermittent systems less saving in labour per therm is effected by increasing the throughput than with continuous carbonization.

(3) Production of a more reactive coke owing to a shorter period of " baking " of the coke, particularly on the outside of the charge.

These advantages will be slightly offset by the following disadvantages:

(1) A possible small increase in fuel consumption.
(2) A possible small reduction in thermal yield per ton.

In addition, the life of the retorts may be slightly shorter in point of time, but the working life in terms of total therms produced should not be less.

It is obvious that the advantages of increased yield per retort per day carried to a reasonable limit will outweigh the disadvantages and will help considerably to reduce the cost of production, particularly if capital expenditure on new plant can be deferred.

How can this desirable increase in the thermal yield per retort per day be obtained? Obviously it is necessary to supply more heat to the charge in a given time, and this can be done:

(1) By increasing the combustion chamber temperature.
(2) By increasing the therms of producer gas supplied to the combustion chamber without raising the temperature.
(3) By increasing the rate of heat transference through the retort walls.

Now it can be assumed that, on a well-managed works, combustion chamber temperatures are as high as the refractory materials will allow, after giving due consideration to working life and allowing a reasonable margin of safety from collapse; therefore it is, in most cases, inadvisable to increase the working temperatures.

There remain the two other alternatives for increasing the quantity of heat supplied to the charge, and it is towards this end that the work of the Fuel Research Board has been directed.

I am indebted to Dr. F. S. Sinnatt, the Director of Fuel Research, and to his staff for a very instructive visit to the Fuel Research Station, East Greenwich, and for the very freely given information relating to their investigations for the help of the fuel industry. Their experiments in horizontal retorts have led to an increased tonnage of coal carbonized per retort per day of 50 to 70 p.ct. The investigations were carried out on a bed of 8 horizontal retorts 23 in. by 15½ in. oval Ω shape by 20 ft. long, and which normally carbonized about 10 tons of coal per day with nominally 11½-hour charges.

By re-circulating some of the waste gases by means of a fan and by increasing the amount of producer gas, the speed of the gases through the setting was increased from 1½ ft. per second to 4 ft. per second, and the input of heat to the charge of coal was so increased (with the same maximum combustion chamber temperature) that carbonization was complete in 6½ to 7 hours instead of 11½ hours.

The larger volume of gases forced through the setting filled the setting very completely with hot gases, and brought the temperatures of the ends of the retorts equal to the temperatures towards the middle. In effect, the exteriors of all the retorts were brought up to an almost uniform temperature, which of course by no means obtains in the normally heated setting. As a consequence of this every portion of the retort was carbonizing very nearly its maximum quantity.

When a fresh charge of coal is put into a hot retort it is obvious that a tremendous drain is made on the heat of the retort walls, causing a very high temperature gradient between the exterior and the interior of the retort wall. In the ordinary heating there is not sufficient heat in the gases to take advantage of this high temperature gradient (the passage of heat through the retort wall is largely governed by the magnitude of the temperature gradient in the retort wall); however, by circulating an extra mass of hot gas full use of this temperature gradient can be made, and the initial stages of carbonizing are considerably speeded up. Shortly after filling the retort a plastic layer is formed which controls the rate of carbonizing, and the temperature builds up in the front of this plastic layer. In other words, with normal heating it is easy at this later stage to supply the heat as fast as the charge can take it.

The effect of circulating waste gases causes a delayed combustion of the producer gas in the setting, with the result that although the maximum temperatures of the retort walls are not increased the average temperature is raised by as much as 100° C. This is a substantial increase in the average head of heat for carbonizing, and undoubtedly helps to increase the throughput.

It will not be well for me to follow further this important investigation, but I would refer my hearers to the two last annual reports of the Fuel Research Board, and we shall all look forward to the next Fuel Research Report, especially as the setting has now been reconstructed and tests have already commenced.

There are reasons which may cause one to think that improvement to a like extent will not be possible in a vertical retort setting.

With regard to labour costs for carbonizing, it may be said that on any particular plant these are approximately inversely proportional to the thermal yield per retort per day, and, consequently, will usually be at a minimum with high throughputs. In the case of verticals, since highest throughputs can only be obtained with comparatively high calorific values, it follows that high qualities and low carbonizing costs are associated.

Auxiliary Gas-Making Plant.

By auxiliary gas-making plant is meant both the plant which is run continuously in conjunction with a straight carbonizing plant and the standby plant, usually carburetted water gas, available for sudden temporary demands.

The former plant makes a diluent gas and is only remunerative when it can supply gaseous therms at least as cheaply as the straight carbonizing plant, taking all factors into consideration, including capital charges and distribution costs. Such a plant may be blue water gas, producer gas, or gas from a complete gasification plant.

The cost of making blue water gas or producer gas is influenced principally by the value of the coke. Every gas engineer can determine the cost per therm of making these gases in his own particular case, but when considering the economy obtained by addition to the straight coal gas, the increased load on the distribution system, owing to the increased specific gravity and the increased volume per therm of water gas, must be fully allowed for. Quite frequently the blue water gas therm is more costly to supply than a straight coal gas therm.

In some cases it may be considered necessary to add blue water gas in spite of a slight adverse effect on the cost of supplying a therm, in order to gain an increase in flame temperature. This may make the difference between the suitability or non-suitability of town gas for certain industrial purposes, and where an increased business field is in sight the future effect on the balance-sheet merits consideration.

Some works make a practice of admitting producer gas or air to their coal gas stream, for the purpose of reducing the quality to the declared value.

The addition of producer gas in minimum controlled quantities, solely for the purpose of maintaining a steady quality, is usually superior to air addition for the same purpose, although it must be remembered that producer gas addition tends to reduce the flame temperature while air addition does not. On the other hand, any increase of the oxygen content of the gas is attended by risk of internal corrosion in mains and fittings. Each method of adjusting quality has its advocates, though it occurs to the author that in some cases the declaration of a higher calorific value, thus dispensing with an exaggerated addition of producer gas or air, would be more satisfactory to management and consumers alike.

When producer gas is used as a means of supplementing therm production, as distinct from its use for maintaining a steady calorific value, its economy becomes doubtful. It can certainly be cheaply produced, but its specific gravity and inert content are so high and its diluting effect so pronounced that it cannot often be added in sufficiently large quantities to be profitable.

The standby auxiliary plant (which most gas-works possess) in the form of a carburetted water gas plant is sometimes worked nominally at a loss, but is considered essential because it can be called upon at very short notice, and in times of national emergency its value is considerable. In cases of a stoppage on the railways or at the coal mines the cost of production is of secondary importance as compared with maintaining the supply of gas for providing the essentials of life.

Two very important developments having vital influences on the question of the auxiliary standby plant have recently come into prominence. The first is the increased

flexibility in output from horizontal retorts obtained by the Fuel Research Board, which has already been referred to, and the second is the advent of the completely automatic water gas plant. Thus on the one hand there is a possibility of dispensing with auxiliary plant altogether, and on the other hand the possibility of working auxiliary plant more profitably. In either case the influence of the coke market is obvious, but the emergency value of carburetted water gas plant, as mentioned above, must not be ignored.

The Declared Calorific Value.

After having indicated the directions in which economy may be effected without alteration to the declared calorific value, *it is now proposed to ignore this limitation and consider the factors affecting the choice of the most economical declared calorific value in varying circumstances.*

It must be remembered that the most economical calorific value to declare depends on several factors, some of which are liable to variation, and consequently, a calorific value declared some years ago may be profitably altered in changed circumstances.

The factors which influence the choice of declared calorific value are many, but there are five of primary importance:

(1) The type of existing carbonizing and auxiliary plant and whether or not benzole is recovered.
(2) The cost of coal and the selling price of coke.
(3) The capacity of the distributing system.
(4) The suitability of the quality to the consumers' requirements.
(5) Anticipated increased demands for gas.

1. *Type of Carbonizing Plant.*

If horizontals form the carbonizing plant the quality of the gas made may vary from 525 to 560 B.Th.U. per c.ft. depending on the type of coal, but little elasticity is possible in the calorific value except by admixture of inerts, which is not a policy to be advocated. However, it will probably be profitable to extract benzole which will reduce the calorific value by approximately 25 B.Th.U. per c.ft., so that the maximum calorific value declarable will be in the region of 535 B.Th.U. per c.ft. It may pay in some circumstances to add a diluent gas—blue water gas or producer gas, if such gases can be made really economically.

In the case of intermittent retorts or chambers, the range of calorific value of a coal gas is lowered to the limits 480 to 550 B.Th.U. per c.ft., owing to the possibility of steaming the charge, but the output of therms per retort per day will fall as steaming is increased, and a calorific value below 480 will probably be uneconomical on this account. Again benzole extraction is likely to pay if other considerations will permit of declaring a calorific value not over 525. The addition of a diluent from an outside plant is less likely to be profitable than with horizontals since water gas can be produced in the retort if desired. It is noticeable that Mr. L. H. Sensicle in the paper given to the Third International Conference on Bituminous Coal at Pittsburg recently gave figures which indicated that a considerably cheaper therm was produced by intermittent verticals when making 540 B.Th.U. gas than when making a lower quality by steaming.

With continuous vertical retorts as the carbonizing plant, the maximum calorific value of the coal gas is about 550 B.Th.U. gross per c.ft. depending on the coal carbonized and the method of quenching the coke before exit from the retort.

In actual practice the maximum calorific value which can be readily maintained with *average* coals, and allowing for the deterioration of retorts which must precede a re-set, is about 510 B.Th.U. per c.ft., which with benzole extraction would be reduced to about 485.

Water gas can be produced in the retorts by steaming the charge, with a consequent increased thermal yield per ton of coal and a lower calorific value.

The extent to which steaming can be effective depends upon the temperature and reactivity of the coke to steam. This latter factor varies very considerably with coke from different types of coal and in some cases seriously limits the quantity of blue water gas which can be produced under normal carbonizing conditions. While the percentage of steaming can, in theory, be increased to the extent of attaining complete gasification, and producing a gas of a calorific value of about 350 B.Th.U. per c.ft., yet this, even when attainable, does not yield generally the cheapest therm.

A blue water gas therm requires much more sensible heat for its production than a coal gas therm; hence it follows that coal throughput must be reduced as steaming is increased, unless any compensating changes come into play, such as (1) variable heat conductivity due to temperature gradient, (2) any modification of reactivity of carbon to steam, (3) any gaseous change due to cracking of primary products, and always assuming that the producer is working at the same productive capacity.

In practice it usually may be taken that as the percentage of steaming is increased, the throughput has to be reduced at a greater rate than the thermal yield per ton is increased, with the result that the therm production per retort per day falls. This being the case it is not economical in the majority of cases to steam below 450 B.Th.U. per c.ft. The economic range of declared calorific value with continuous carbonization is thus narrowed down to the limits 450-510 B.Th.U. per c.ft. (or 25 B.Th.U. lower with benzole extraction). Having arrived at these limits, how is an exact choice of calorific value to be made?

The sensible heat in the coke will usually enable sufficient water gas to be made with dry steam to reduce the calorific value to about 480 or 485. Moreover, by using only the sensible heat in the coke for blue water gas formation, no additional fuel should be required, and no reduction of throughput should be involved. For lower calorific values more fuel will have to be used and throughputs reduced.

It is apparent that the making of blue water gas beyond a certain limit in a continuous vertical retort is not attained without some labour and fuel charges and some extra capital charges, as more plant will be required as the thermal yield per retort per day is lowered. Nor are these the total charges to be made against the blue water gas produced in the retort. The effect of steam on the brickwork of the retort is detrimental, and increased steaming definitely involves a higher repair bill over a period of years. Lastly, it is very often found that as the calorific value is reduced by increasing percentages of steam, the thermal yield per ton does not increase as theory suggests. There is a loss in the therms of straight coal gas produced per ton of coal, probably caused by less cracking of the primary gases, which explains the increased quantity and altered quality of the tar often obtained. In this case the loss of gaseous therms may be aided by an excess of steam entering the retort, over and above that converted into blue water gas. A maximum efficiency of steam cracking is likely to lead to a minimum loss of straight coal gas therms. If benzole extraction were practised on continuous vertical retort gas the effect on calorific value would be the same as that of a certain percentage steaming; but although the thermal yield per ton would be less, there would be no adverse effect on throughput. It is quite conceivable, in fact, that the extraction of benzole from steamed vertical gas may allow such an increase in throughput with a higher crude gas calorific value that the saleable gaseous yield of therms per retort per day may be as high as without benzole extraction.

2. *Cost of Coal and Selling Price of Coke.*

If the cost of coal is very high in relation to the revenue from coke it will pay from the production point of view to use a minimum amount of coal and make water gas from the coke either in vertical retorts, or in a separate plant; distribution considerations may, however, demand a modification to such a policy. On the other hand, if coke will realize a price per ton approximating to the coal cost per ton a higher quality coal gas will be most cheaply produced and distributed.

3. *Capacity of Distribution System.*

Generally the capacity of the distribution system varies directly as the calorific value, since the density is usually lowest with highest qualities and *vice versa.* It is apparent, therefore, that a reduction of calorific value will have a twofold effect on distribution—a larger quantity of gas of a higher density to distribute, which, if the system is already taxed to its limit, will involve immediate expenditure on mains. An increase of calorific value, however, at once increases the carrying capacity of the distributing system in therms, and the expenditure in this direction may be deferred for some time.

4. *Suitability of Quality to Consumers' Requirements.*

It was established some years ago by the Gas Investigation Committee of the Institution of Gas Engineers that all calorific values within fairly wide limits are practically equally efficient for most purposes for which gas is used, if the apparatus is suitably designed or adjusted and pressure is adequate. For certain industrial purposes in some towns, however, flame temperature is very important—even a very small increase may show a marked increase in efficiency in isolated cases. In this respect a high proportion of CO is required with less H_2 and CH_4 than is usual, while the percentage of air-free inerts should be as low as possible. A town gas of, say, 450 B.Th.U. per c.ft. with a low inert content (12 p.ct. or less) will usually give a higher flame temperature than a high quality straight coal gas.

5. Anticipated Increased Demands for Gas.

This factor is well worth considering if a re-declaration of calorific value on other accounts is contemplated. Suppose a gas undertaking, whose carbonizing plant consists largely of continuous verticals and whose declared calorific value, for the sake of argument, is 450, is faced with the necessity of providing for a 5 p.ct. increase in output, which will be the cheaper means of obtaining the increased output—additional carbonizing plant *or* the re-declaration of a higher calorific value, thus allowing an increased therm production per day on the existing plant? In the latter case the increased output may require no modification to the distribution system, although some slight modification to consumers' appliances may be necessary.

It may be gathered from a critical examination of all the above factors that in most cases where a re-declaration of calorific value is under consideration, the tendency will be towards a higher rather than a lower quality.

Experience in Birmingham has been applied to a very careful estimate of costs into holder from continuous verticals at 500 and 450 calorific value compared with the declared value of 475. These estimates show a reduction in production costs of about 0·015d. per therm on 450 calorific value and an increase of about 0·010d. per therm on 500 gas, in both cases exclusive of capital charges. Taking these into account and also distribution charges the 500 gas could probably be delivered cheaper than 450 gas and at nearly the same cost per therm as the present gas of 475 calorific value. It is quite possible that the cheapest therm of all could be delivered at 480 or 485 calorific value.

CHOICE OF NEW CARBONIZING PLANT.

It is not proposed to consider all the points which would influence the choice of carbonizing plant for a new gasworks in any particular district. Rather it is intended to discuss briefly the factors influencing the choice of additional plant required as outputs increase, and also the plant required to replace sections of carbonizing plant as they become obsolete.

In these circumstances choice of new plant is limited by:

(1) The types of coal available.
(2) The coke market.
(3) The auxiliary gas-making plant.
(4) The present declared calorific value.
(5) The probable cost of production including capital charges.
(6) The effect on distribution.
(7) The suitability of the gas for consumers' requirements.

(This factor has been previously dealt with.)

1. Types of Coal Available.

This subject was dealt with at such length under the heading of "Coal" that there is no need for further mention.

2. Coke Market.

In many towns great pains have been taken in building up a profitable market for a particular type of coke, and to put a different type of coke on the market requires very serious consideration. If, for instance, the consumers have been gradually educated to appreciate the free burning quality of continuous vertical coke in domestic fires, much business may be lost by substituting a denser and less free burning coke.

3. Auxiliary Gas-Making Plant.

If no auxiliary plant is available—*e.g.*, blue water gas plant—it will be necessary for the new carbonizing plant to make gas of the declared calorific value; this may have a limiting effect on the choice.

If, however, there is a surplus of auxiliary plant, it may pay to put in a new carbonizing plant of smaller output than the required addition and make up the quantity, at the same time adjusting the quality, by blue water gas addition. Such a scheme would reduce the capital outlay.

4. The Present Declared Calorific Value.

This is a very important factor and has already received detailed consideration under the heading "Declared Calorific Value" in which the limits of calorific value with various carbonizing plants were indicated.

The only new point to be considered under this heading is the opportunity which may be offered to modify the declared calorific value to suit the combination of old and new plant.

5. Probable Cost of Production Including Capital Charges.

It can be said that the differences in the capital cost per therm of all the usual types of high-temperature carbonizing plant are very small indeed, while the costs of production vary considerably with local conditions—notably geographical position and the residual markets. Each engineer must correlate the whole of the conditions affecting costs before coming to a decision.

6. Effect on Distribution.

Under this heading continuous vertical retorts have an advantage over all other high-temperature systems since for any given calorific value within the readily attainable limits the specific gravity is lower than with intermittent systems, either used alone or in conjunction with water gas, however produced.

Gas from continuous verticals also tends towards cheaper distribution in its comparative freedom from naphthalene. This advantage is discounted, however, when benzole is extracted and naphthalene is either automatically removed in the oil washing system or specially dealt with prior to an activated carbon plant.

CONCLUSION.

An endeavour has been made to indicate the possibilities, largely from the works side, of delivering a cheaper therm to the consumer. The author may be accused of dwelling too much on carbonization to the exclusion of other aspects of works economy, but he feels that no apology is needed as problems of carbonization so closely affect the prosperity of all our undertakings.

At the conclusion of his address, Mr. Tomlinson acknowledged the great help in its preparation which he had received from his assistants and also from Mr. Rhead.

Mr. W. S. MORLAND (Gloucester) said the address showed much knowledge and experience, and he moved that their best thanks be given to Mr. Tomlinson for it.

Mr. LANGFORD seconded this, and after it had been enthusiastically endorsed by the members, Mr. TOMLINSON said he had endeavoured to put before the Association the various phases of the carbonization problems which they had to consider.

Alderman J. H. LLOYD, Chairman of the Birmingham Corporation Gas Committee, remarked that they had had an address of great value. It gave the Committee great pleasure that Mr. Tomlinson had been elected President, and on behalf of the Committee he extended to the Association a hearty invitation to visit Mr. Tomlinson's works, when everything possible would be done to further the useful work of the Association and to make the members welcome.

The date fixed for the visit was Thursday, May 12.

STREET LIGHTING AND PHOTOMETRIC ACCURACY.*

By C. C. PATERSON

Most of us are distressed to see the tendency in many districts to favour types of street lighting of what one may call an exaggerated directive type. Refractors and reflectors are good, but if they concentrate too much light in a generally horizontal direction towards the midspan position, they introduce a too brilliant light in the field of view of the motor driver. He fails properly to see pedestrians or cyclists who lie in his way beyond the glaring light, and accidents are more likely to happen. Time and again this has been appreciated by district surveyors and engineers who refuse to recommend such systems, but these have been overruled by the lay members of their committees. These men have not yet learnt that the first object of a light is to illuminate the object to be seen and not the eye of the observer. They are attracted by the brilliance of the light and so insist against better advice on the installation of glaring systems of street lighting. The householder, who does not generally understand the connection between lighting and street accidents, often gives his support, and so, for lack of proper education, instead of having good visibility combined with cheerful streets we are getting a lot of bad visibility with garish brilliance. Manufacturers are not entirely to blame, for they must supply what is demanded.

A subject which has bothered illuminating engineers as well as those who preceded them—under another name—

* From a lecture at the inaugural meeting of a branch in Manchester of the Illuminating Engineering Society, March 10.

has been the uncertainty of all their measurements. This has always been a reproach and a serious disadvantage. But there was nothing to be done. If a greater accuracy than 2 or 3 p.ct. was wanted, even under favourable laboratory conditions it meant several repeat readings with more than one observer. If an accuracy of ½ p.ct. were required one sat down for a good week's work. How different the outlook now.

In a paper presented to the Illumination Congress it was brought home that with photoelectric methods an accuracy of 1½ p.ct. is easily obtainable with commercial photometry —and with speed in working. The constancy of commercial lamps themselves is hardly greater than this. But the advance is not merely measured by this figure of accuracy. The photoelectric method can be arranged to give a high accuracy over a considerable range of colour—so that instead of having, as previously, to have several observers and take the mean to eliminate the personal photometric error, one setting by one observer now suffices. Those who do not work in the laboratory may not realize the avenues that this opens up in making possible statistical investigations involving photometric results. Such efforts previously could scarcely be reconciled with logical deductions.

It can only be a matter of time now before these methods are applied to illumination photometers for street use, and we shall be saved the humiliation of having to say that our measurements of illumination in the street cannot be trusted to within + or − 10 p.ct. or 15 p.ct. This is at present a serious matter. The British Street Lighting Specification, which was at first mainly used to assist in the purchase and sale of street lighting installations, is now beginning to be seriously applied by public works authorities to their maintenance undertakers. This means that before long every city which takes its street lighting seriously will require its installations to be maintained within a certain definite limit of their rated values. Such requirements will have to be determined systematically by street measurements. Hence the vital importance of developing methods the accuracy of which are beyond doubt.

It is hardly too much to say that the whole question of the really effective maintenance of street lighting depends upon our ability to improve greatly on the accuracy of our present methods of street measurements. This is a need which a few years ago would have been declared impossible of fulfilment. To-day it is a virtual certainty, although not actually in its practical form.

Recent Developments in the Use of Tar for Road Purposes*

By W. E. Cone, Technical Adviser, British Road Tar Association.

The important increase in the use of tar for the construction and maintenance of roads during the last few years may be primarily ascribed to the fact that the great advantages of properly prepared tars for producing a densely compacted safe surface, or a waterproof safe dressing for existing road surfaces, are being continuously endorsed in practice.

The marked improvement in the design and structural efficiency of the tarred macadam road has been largely brought about by more accurate scientific methods of control over the technical operations, and the careful attention which is now given to precise details of manufacture and construction. It is especially significant that the large fund of information gained from practical experience with tarred road construction has demonstrated the fact that the best results can be obtained only when road materials are selected and used with the closest regard to scientific principles, and under proper supervision and control.

The importance of using properly prepared tars to meet the highest requirements demanded by the technique of road tar construction cannot be stressed too much, and it follows from this that material should only be supplied in strict conformity with British Standard Specification, or to the special requirements of the surveyor. For this reason the British Road Tar Association have constantly endeavoured to improve the standard of road tar, with the result that a British Standard Specification dealing with Tars (Nos. 1 and 2)† for road purposes was published on Jan. 1, 1930, and a British Standard Specification for Tar No. 3 for road purposes was published as No. 76—Part II., in March, 1931.

To summarize the present position, it would seem from road experience, particularly from that of the surface tarring of roads, that the modern trend of opinion is emphatically favouring the use of more viscous tar than hitherto, and it seems probable that, with further experience, tars of even higher consistency will be demanded. It is evident, therefore, that the improvement of the present standards of tar must be always kept in mind, and, by the experience gained from their use, every endeavour made to improve upon them.

A clear understanding of the influence which good materials and the best constructional methods exert on the results to be obtained by the use of tar is one of the main requisites for bringing about still further improvement. The influence of location, foundation, traffic, materials, manufacturing and constructional methods, should all be studied, if the great advantages of tar for the efficient and economical construction of roads are to be obtained.

The value of careful and comprehensive preliminary studies cannot be over-estimated in determining the best types of construction to meet traffic demands.

The proper use of road tar requires, as a primary consideration, a correct appreciation of the above-mentioned factors; given the attention they deserve, there need be no misgivings as to the ability of well-constructed tar roads to withstand heavy traffic conditions.

Noticeable Improvement.

It is satisfactory to record that there has been of late a noticeable improvement in the construction and treatment of roads with tar. The salient features of progress in tarred macadam manufacture are the use of higher consistency tars, and a more uniform grading of the aggregate. The results of the advancement so far achieved show clearly the increased resistance of properly balanced mixtures of tar and aggregates to deformation under such stresses as are imposed upon the tarred macadam surfacing by heavy traffic conditions. The modern tendency is to produce a denser mixture, characterized by a much smaller proportion of voids than that usually associated with tarred macadam in the past. In this connection, experience has shown the desirability of incorporating with the coarse and medium aggregates suitable quantities of mineral filler. The stability of the mixture increases as the voids in the aggregate decrease, provided the proper amount of tar is used. By varying the size and grading of the aggregate and the consistency of the tar, it is possible to control the stability of the mixture to a degree necessary for roads designed to carry light, medium, or heavy traffic.

While peculiarities of traffic, foundations, and other considerations will determine which type of tarred macadam should be employed, in each case the nature of the materials and the method of construction ensure the necessary properties to prevent displacement under the prevailing traffic conditions, with a granular surface which eliminates skidding.

The determination of the thickness to which tarmacadam should be laid, and the desirability of laying the material in one or more courses, are matters which do not receive the careful attention they deserve, although some information has been obtained in connection with the relation of design to service results. Just what minimum or maximum thicknesses are most desirable remains to be determined.

In considering this question, one is forced to the conclusion that the general practice of laying tarmacadam in more than one course is largely the outcome of a dependence upon the base course material to cover up inadequate and weak foundations. There would appear to be no justification for laying a base course or an intermediate course consisting of substantially coarse aggregates as a component part of the wearing surface, when, in fact, a properly balanced mixture of tar and aggregates—laid on a well drained and strong foundation—in single unit form would give the requisite structural strength and stability to withstand heavy traffic conditions.

Influence of Soils.

In view of the great importance of the foundation in the construction of roads, it is surprising that so little scientific

* Paper before the Scottish Junior Gas Association (Western District), Glasgow, March 5, 1932.

† British Standard Specification for Tars (Nos. 1 and 2) and No. 3. British Standards Institution, 28, Victoria Street, London, S.W. 1.

attention has been paid to the nature of the soils and the proper corrective measures to be used, in order to increase the stability and permanence of the structures which really support the traffic. In addition to the points mentioned above, a study of traffic weights and impacts to be resisted would be highly informative as to the type of wearing surface best suited to traffic requirements. It is understandable that, in the absence of accurate information on these important points, there is the tendency to play for safety by laying additional thicknesses of material, but this is not the way to increase efficiency and economy in the use of tar.

It is recognized that excellent results have been, and will continue to be, obtained by the use of tarred macadam laid in more than one course. The point of importance is that no obstacles, whether of inequalities of foundation or reluctance to alter present practice, should be placed in the way of using such combinations of tar and aggregates in whatever manner engineering and chemical skill and economical conditions indicate as the most suitable.

The British Road Tar Association have given special attention to this question, and, as the result of practical experiments carried out in several districts, much valuable information has been obtained. As the outcome of these investigations, it has been found that a consolidated thickness of 3 in. of carefully graded aggregate and high consistency tar laid on a well drained and unyielding foundation in single unit form will provide a road surface capable of withstanding very heavy traffic.

There would appear to be no useful purpose served by increasing the thickness of the wearing surface beyond 3 in., and certainly no advantage is to be gained by laying the material in two separate courses. The generally accepted belief that tarmacadam can be laid on any sort of foundation has been very largely responsible for the methods of manufacture and construction which are now in vogue.

Attention is drawn to this matter in the hope that a more correct appreciation of the relationship of the design of wearing surfaces to foundation will receive the consideration it deserves. If it be shown that a road composition is improved by careful study and application, then it should be worth while to continue that study until the limit of improvement is reached.

Providing Non-Skid Surfaces.

In dealing with the surface tarring of roads, the salient features of progress are the use of higher consistency tars and large gauge hard chippings. From observations made in different parts of the country, such methods have been particularly successful in providing a non-slippery surface, both for water-bound and other types of roads. Regardless of type of material used, time and traffic will affect any road, but with an occasional surface treatment to replace what has been worn away, every type of road may be simply, easily, and inexpensively maintained with tar.

The Association have given special attention to this question, and as the result of investigations made in several districts they have drawn up recommendations for surface tarring. As the outcome of these investigations, it has been found that a relationship can be established between the consistency of the tar and the most suitable gauge of the gritting material. It therefore remains merely to employ the prescribed quantity of gritting material, and compress it with a light roller.

In special cases, such as the surface tarring of concrete roads, it is essential, as part of the preparatory work, that the incrustation which forms a film on the surface of newly constructed concrete roads should be removed by brushing with wire brooms. This film does not adhere strongly to the concrete, and in time it either wears off or scales off. Unless this film is allowed to wear off, or is removed by some other means before commencing tarring operations, a failure is almost certain to result.

The best results will be obtained by a double surface treatment, which may consist of applying a prime coat of liquid creosote, or a tar of such consistency and penetrative power that it readily enters and protects the cement mortar and individual particles of the aggregate. In each case, the priming coat should be brushed out to give the maximum spread. After an interval of twenty-four hours, tar complying with the No. 2 Specification should be applied in sufficient quantity to seal the entire surface thoroughly, followed by a top-dressing of approved gritting material, free from dust, and of $\frac{3}{8}$ to $\frac{1}{4}$ in. gauge. The gritting material should be pressed down into the dressing with a light roller.

In districts remote from tarmacadam plants, grouted macadam, or the penetration method of road construction, still has a considerable vogue.

A grouted macadam road is constructed by laying approved mineral aggregate upon a prepared foundation to a sufficient depth to provide a consolidated thickness of 3 in. after dry rolling. Tar is then applied by hand or pressure, the surface being finally covered by chippings. The requirements as to the permissible size of the aggregates are not very rigid, but the objective should be to secure a structure of uniform moderate void content after dry rolling. If the surface is too dense, difficulty will be experienced in getting the tar to penetrate into it, and if it is too open the tar will collect at the bottom. As it is desirable to have as great mechanical stability as can be obtained, it is better practice to use coarse aggregate ($2\frac{1}{2}$ in. and $1\frac{1}{2}$ in.), and if the voids are large they can be partially filled with chippings during the dry rolling.

Application of the Tar.

The tar should comply with the British Standard Specification for Tar No. 3, and should have a viscosity of between 180 and 240 seconds. It should be heated to a temperature between 250° and 300° Fahr., and applied evenly and steadily to the rolled dry aggregate, one gallon being used to treat each square yard.

After the application of the tar, the surface should be covered immediately with hard dry chippings, and should be rolled until there is no further movement. The construction of a grouted macadam road requires the utmost care in every detail if the best results are to be obtained.

The use of tar emulsions for the surface dressing, patching, and reconstruction of roads is growing, and a number of preparations are being used with success. In this connection, there would appear to be a field for development in the use of tar emulsions for what is known as the mixed-in-place method of constructing macadam surfaces.

This method, as distinct from the penetration method (grouting and semi-grouting), consists of spreading loose dry aggregate on the road surface, making two applications of hot tar and mixing *in situ* by means of a blade grader, maintainer, or similar approved road machine. The mixing is continued until the aggregate is completely coated, and then consolidated by rolling. A seal coat of tar and hard chippings is then applied on to the clean, dry surface, and well rolled. This form of construction, under the name of "Re-Tread," is extensively used in America, mainly on water-bound roads, and has given satisfactory results. It is important in this class of work that the binder should remain plastic long enough to permit the necessary mixing of the coated stone, and yet hardens quickly enough to provide the necessary stability for the mixture to respond to the rolling operation, and thus ensure early completion of the work. The use of a tar emulsion would render the aggregate more susceptible to mixing and levelling with the blade grader or maintainer, and enable the work to be carried out entirely in the cold state. The author is not aware that this process has ever been tried, using a tar emulsion, but considers that it is worthy of investigation.

The question of coloured roads is one which is exciting considerable attention, and when the difficulty of conserving colour under the ravages of atmospheric and traffic conditions has been overcome, much more may be heard of them.

The use of tar for the treatment of roads began to attract the serious attention of highway authorities about twenty-five years ago, and in the period since that time it has grown steadily in favour, until it is now used to a greater extent than any other road-making material.

Investigations completed by the British Road Tar Association during the last few years have done a great deal towards the improvement that has been brought about in road tar technique, which is reflected in the high standard of work to be seen in all parts of the country. The Association are fully conscious of the necessity of improving in every way possible the quality of road tar and its methods of application, and further improvements are envisaged by experiments now being carried out in different parts of the country.

Whereas in the past the making of a road was an art of decidedly individualistic character, it is now rapidly becoming a technical operation, subject to rigid control at every stage. It must be remembered that the science of road-making is comparatively young, and is undoubtedly capable of great future development. The producers and distillers of tar must play their part in this development work by co-operative effort in seeing that the quality of road tar supplied to the engineer and surveyor is best suited to meet his requirements for the construction and maintenance of roads.

It is only by the closer union of practical experience and scientific inquiry that we can look for progress, and with the wider range of scientific appliances now available in the Industry the problems can be dealt with from many new aspects, and the way to further advances thereby prepared.

Hydrogenation*

By E. F. Armstrong, Ph.D., D.Sc., LL.D., F.R.S.

The use of hydrogen in conjunction with oil and coal is only on the threshold of industrial application. This is a subject of absorbing interest the world over; very large sums have been spent in experimenting and perfecting, nowhere as yet are plants in existence on a commercial basis. Though the problem has been solved technically it is still far from being economically attractive.

Thanks to the advent of the internal combustion engine, this is an age of oil; on land or sea and in the air oil reigns supreme. There have been fears as to its possible exhaustion, as yet we have really used very little of it in total; at first it was wastefully produced. Oil displaces coal; therefore the question arises, Can it not be produced from coal in greater quantity than the tar or oil is produced in a gas-works? Bergius gave the first solution. Coal made into a paste can be hydrogenated under pressure to oil, and to-day a large yield of oil, mostly petrol, can be obtained from a suitable coal. The bye-product is mainly methane, from which hydrogen can be made when it interacts with steam in presence of a catalyst. The plant is an elaborate and costly one, and so far the cost of producing petrol is put down at 7d. to 8d. a gallon, which has to compete with a price of less than 2d. a gallon at the oil field. Such figures are only of passing import; the 7d. will be reduced, the 2d. may grow larger. What is important is that petrol can be produced from coal at prices within practical bounds, so that oil could be produced from coal in this country when circumstances required.

The second half of the problem is the hydrogenation of tar. This, as produced from coal either at a gas-works or by low-temperature carbonization, contains less hydrogen in proportion to carbon than does natural petroleum. Such oil can be readily hydrogenated under increased pressure in presence of a number of catalysts yielding a commercial quality of petrol of high anti-knock value. Such low-temperature oil can be hydrogenated more cheaply than coal, and once it is available in really large quantities, a new home oil industry could be built up on it. It is only produced, however, together with a smokeless coke fuel, in such proportions as 20 gallolns of oil to 13 cwt. of the fuel. This fact makes the production of the oil, viewed from the commercial standpoint, essentially one of the production and sale of low-temperature fuel. Until the coal factors and the public are educated to using such fuel, the quantity of oil produced, even in countries which have no native supply, will lag behind the potential demand for it.

Many of the residues produced in refining oil are of low value; catalytic hydrogenation converts these into much more valuable products. Large experimental plants have been built in America to study this question on a commercial scale, and have met with success; and there is every reason to suppose that but for the present glut of natural oil they would have become part and parcel, along with cracking and refining plants of the oil industry. The price of petrol is, however, so low to-day that it will hardly permit of any treatment beyond topping the crude oil. The usefulness of hydrogen is understood to be so far confined to the production of what we may call special synthetic lubricating oils.

One of the good features of the hydrogenation process which in the future may have some bearing on its application is the property hydrogen has of removing the noxious sulphur in the form of hydrogen sulphide gas.

Should the oil industry even take seriously to hydrogenation, it has a potential cheap source of hydrogen available in the form of methane, which readily interacts with steam forming hydrogen and carbon dioxide; either natural gas or waste refinery gas are at hand in large quantity at the very lowest cost, so that oil hydrogenation will have much cheaper hydrogen available than any ammonia plant.

* From a paper before the Royal Society of Arts, March 16.

Manchester and District and Yorkshire Junior Associations

Joint Meeting, Stretford, March 9

Members of the Manchester and District Junior Gas Association and the Yorkshire Junior Association visited the extensive works of Messrs. W. & B. Cowan, at Stretford, Manchester, on March 9, where they were received by Mr. H. Butterworth (Director) and the members of the technical staff, who also conducted them around the works.

The Victory Works.

The Stretford meter making works of Messrs. Parkinson & Cowan (Gas Meters), Ltd., is one of the most modern factories of its type, being ideally situated with regard to transport and convenience. It is laid out along the most modern lines having due regard to the various processes in use for the manufacture of the material, and the lay-out is such that useless handling of material is obviated.

There is a fine brass finishing department in which the most modern methods are used, and some remarkable examples of capstan work were inspected. The assembling of brass parts to form prepayment movements is attractive, and the skill of the operatives is obvious from the high standard of the finished product. The stamping department, in which the various pressings that make up a meter are produced, was a source of great interest, particularly in regard to the production of hot pressed stampings. Adjoining the stamping department is a well equipped tool making department, in which some excellent examples of tool making were inspected. In the meter assembly department meters of all types were inspected in process of manufacture, and the various stages through which the meters are passed ensures perfect assembly and manufacture of the final product.

At various stages the meters are subjected to searching tests and examinations to eliminate faults arising during manufacture. The treatment of the diaphragms is a matter of the utmost importance, and great care is taken to ensure perfection. The foundry is entirely gas fired. In another section of the works automatic machines were in operation for the mass production of small components; the equipment for the hobbing of wheels is of the most modern character. In the engineering department the material for the conversion of a 100,000 c.ft. per hour station meter to bell type was being manufactured, and a 25,000 c.ft. per hour bell meter was under test at the time of the visit.

The whole works is self-contained, and the meters are made from the raw materials.

After the round of the works the party adjourned to the Stretford Town Hall, where high tea was served at the invitation of the Directors. The proceedings were presided over by Mr. W. W. Parkinson, Acting Chairman of the Company.

Mr. H. B. Knowles (Manchester President) moved, and Mr. J. W. Holroyd (Yorkshire President) seconded, a vote of thanks to the firm for their hospitality.

Mr. Parkinson and Mr. Butterworth briefly replied.

DESIGN AND MANUFACTURE OF DRY GAS METERS.

By E. Butterworth, of Messrs. W. & B. Cowan, Ltd.

The earliest form of dry meter appears to have been invented by John Malam in 1820, but further improvements and new types were devised by Sulivan and Defries at a later date. The first really practical invention was that of Richards in 1844, and subsequently Col. Croll, in 1856, brought out a meter which is substantially the same as those made to-day, for since that date the general design of the meter has remained unchanged, although many efforts have been made to improve upon it.

During recent years we have had a great number of new inventions and attempted improvements to the dry meter, but with all these the original design is fundamentally unchanged. Considering that there is a great deal of inherited experience employed in the manufacture of gas meters, the product was an almost perfect piece of mechanism, which was capable of measuring gas accurately over long periods at varying rates of consumption and in every way giving the utmost satisfaction. Nevertheless, until about ten years ago, the dry gas meter was an extremely slow-moving piece of mechanism.

Since that time many changes have taken place in the respect that it has become necessary to provide small gas meters giving a large delivery of gas with a small pressure

loss. And as one rarely finds a gas meter in a really accessible part of a domestic habitation, it is necessary that the over-all dimensions of gas meters should be kept as small as possible, while being capable of passing large quantities of gas.

There are really no standards in use which specify what a meter shall pass with a given differential pressure, with the exception of the single regulation imposed by the Gas Act, which states that a meter shall pass its badged capacity, with a loss of pressure not exceeding 5-tenths W.G. between inlet and outlet.

Standard Meter.

The first step taken was to introduce the Standard type of meter, and for the purpose of this paper it is only proposed to consider the 3-light size of case for comparison.

The original 3-light gas meter gave a delivery of 18 c.ft. per hour, with an allowable loss of pressure of 5-tenths between inlet and outlet, but the new Standard meter, termed the No. 2 size, had a capacity of 40 c.ft. per hour with the same allowable pressure loss. How was this accomplished? Both the meters were made with the same over-all dimensions of case.

The first and most important alteration was that the diaphragms or bellows were re-designed. In place of the old type, a diaphragm which took the form of a circular disc of leather fitted with large piston discs was fixed to the meter, with the result that the amount of gas displaced by one cycle of operations of the meter was increased from 0·125 to 0·166 c.ft. By this means it was then unnecessary to make a very great increase in the speed of the revolution of the working parts, although it must be admitted that the meter did work faster, but not in proportion to the increase in capacity per hour.

After this type of meter had been on the market for several years, it was found that, while a considerable advance on the old lights type had been made, meters were still not capable of passing large enough volumes without undue loss of pressure to meet situations in which further increases had been made in the number of appliances in use, and the accompanying increase in the consumption of gas.

High-Capacity Meter.

A great deal of experimental and research work was then undertaken, to make still further improvements, with the result that the high-capacity meter was designed in its present form. The capacity per hour was increased to 80 c.ft. with the same allowable pressure loss as previously, but after a short time this was further increased to 100 c.ft. per hour for the same size of meter.

This result was obtained by again re-designing the diaphragm meter and still further increasing the displacement of gas per revolution, while major improvements were made by reducing friction in the gas stream and working parts of the meter.

While great improvements were made in the design of diaphragms, attention was paid to the stream of gas so that this should be disturbed as little as possible, and ample space provided in the passages to avoid loss of pressure in this direction. The valve ports were increased considerably, and a special study was made of the actual movement of the gas in all phases, to eliminate as far as possible undue friction and gas eddies which are undoubtedly a source of trouble in gas meters which are not correctly designed.

It is now possible to make high-capacity meters in which a certified amount of gas would be registered accurately, with the meter only absorbing between 1 and 2 tenths between inlet and outlet, where previously the governing factor had been 5 tenths.

An important matter in the manufacture of high-capacity meters is the accurate control of the gas by means of the slide valves, in order that the meter shall give a perfectly steady outlet pressure at all speeds; and this can only be done by extremely accurate timing of the slide valves relative to the movement of the diaphragms. Any error in this timing will have a detrimental influence on the outlet pressure, causing oscillation on the outlet of the meters.

With the growth of the use of high-capacity meters, it was not sufficient for the manufacturer of gas meters simply to re-design the meter in order to give the increased delivery of gas; the most careful consideration had to be given to the materials used in manufacture in order that he could, with confidence, give as good a guarantee of accuracy and durability as that previously given to the Gas Industry with lights type and standard meters.

To attain this object every piece of material used in the construction of the meter was carefully considered in the light of the work which it had to do. The first part which came under review was naturally the diaphragm, because, while the speed of meters had been increased, changes also were being made in the manufacture of gas; and it was essential that the meters should be as uniformly successful under the changed conditions as they had been in the past.

To ensure a perfect product the manufacturer must control the material from the earliest stages and adjust the manufacturing processes in such a way that there will be no variation from the standard specification of the material.

Treatment of Diaphragm Leathers.

The leather used in the manufacture of our diaphragms is obtained from the finest Persian (East India) sheep skins, and is bark tanned by the natives in the Far East before being shipped to this country. On receipt at our tannery the sheep skins are carefully inspected, and only suitable skins put into work for gas meter leathers. The selected skins are carefully shaved by machine to render them uniform in thickness and to remove various superficial defects such as shallow butcher cuts. After being shaved, the skins are partially de-tanned, and then re-tanned by the process known as semi-chrome tanning. The system of replacing part of the bark tannin by chrome tanning compounds was instituted after careful research had shown that semi-chrome tanned leathers were much more resistant to the destructive action of water and water-soluble compounds resulting from various components of coal gas.

After many more processes the skins are again carefully inspected, and portions perforated by thorns, &c., are marked to prevent the possibility of a diaphragm being made from a faulty piece of leather.

The diaphragms are cut in such a manner that no portions of the skin which are liable to stretch or shrink are included in the finished product. This is a very expensive yet necessary procedure in order to obtain uniformly good quality in the finished product.

At this point the leather has now undergone several different inspections, and a further one is made to ensure that there are no perforations in the diaphragm. This is done by examining the leather with the aid of powerful transmitted light in a perfectly dark room, and it is viewed at different angles so that no fault escapes the examiner.

At this stage the leather has not yet been treated with the preservative oils and dressing which are required to protect the fibre of the leather from the action of coal gas. The next process is the dressing of the diaphragm, and is correctly considered by meter manufacturers as the most important stage in the manufacture of gas meters. The material used for this purpose must be such that it will preserve the leather over a long period and be unaffected by the action of the gas. It is a well-known fact that the light oils which are present in coal gas have the effect of mixing with the dressing and lubricant of the diaphragms, the result being that if the dressing is not of the right type it will lose its viscosity by the addition of the light oils from the gas, and drain from the diaphragm.

During a long period the effects of gas on leather dressings have been carefully observed, and a great deal of expensive research work has been undertaken to find the reason for the deterioration of diaphragms in dry gas meters. It has been found that the trapping of light oils by the dressing is one of the main factors, because when the dressing loses its viscosity there is a tendency for it to drain off, and be washed away by the light oils and benzoles from the gas, thus leaving the leather in a state in which it has no resistance to the action of coal gas.

There is another point which is very important, and that is that after the dressing drains off the leather it leaves it rather hard, and cracking ensues. Some very valuable research work in this connection has been undertaken by Mr. R. S. Andrews, Chief Chemist of the Metropolitan Gas Company, Melbourne; and one of his conclusions was that the perfect leather dressing would be insoluble in the light oil in the gas and remain indefinitely unchanged.

To accomplish this presents a formidable problem, but there is no doubt that in certain instances leather dressings have been produced which, so far as present experience goes, meet the case satisfactorily, while there is no doubt that almost any leather dressing yet produced will absorb, or be soluble to a varying degree in, the light oils and benzoles from the gas. We are, however, of the opinion that a leather dressing which is capable of absorbing a small proportion of benzole without lowering the viscosity to any great degree, definitely meets the case.

Special methods of treating the diaphragms after the leather has been dressed with lubricant are used to increase the durability of the diaphragms; and this is termed "seasoning." It consists of allowing the leathers to stand for a period varying from two to three months after being dressed, before they are actually fitted to gas meters. This allows the material thoroughly to absorb the leather dressing, and the fibres of the material take their normal position and contour before any stress is imposed upon them. This certainly prolongs the life of the meter greatly, and diaphragm troubles are by this means almost eliminated.

Deposits on Valve Faces.

Another point which appears to cause a great deal of trouble in gas meters is the question of deposits on the

valve faces. This trouble has been with the Industry for a great many years, and although a good deal of research work has been made to endeavour to obtain a mixture of metal for the slide valves and seats, the trouble still persists in certain cases; but by re-designing the valves there is no doubt that this trouble is now fairly under control.

The valve faces have been reduced to eliminate friction as much as possible consistent with satisfactory wearing surfaces, and by the narrowing of certain bearing surfaces the effect of deposits has been minimized to a great degree. This procedure has been very necessary on account of the higher speed at which meters are now called upon to work, and, also, modifications have been made in shape in order to obtain the largest available port area to limit the pressure absorbed by the meter.

The materials from which the working parts are made are maintained at a high standard by confining the mixture to accurate specifications, particularly in regard to the white metal parts used, and in some cases it has been necessary to mix the metals at the meter maker's works in order to control the mixture perfectly.

The stuffing boxes used in gas meters have called for special consideration. These should be accurately gauged to maintain correct working, and careful attention should be paid to the quality of the packing material used in them. This is made from the finest wool and is immersed in a special lubricant, the composition of which has been arrived at after long periods of test under actual working conditions. This is one of the danger points in the gas meter, owing to the possibility of explosions caused by small leaks at these particular points, and consequently the parts in question have received special attention.

The modern gas meter maker pays a great deal of attention to the worm and wheel used in the gas meter for driving the index mechanism, and although this appears to be a minor detail it is a surprising fact that it is the source of a great deal of trouble if not correctly manufactured.

After long experience it has been found that a special form of thread should be made on the worm with a wheel which is generated to be in exact mesh with the worm, and the manufacture of both parts should be undertaken in such a way that perfect uniformity is obtained. A slight variation in the angle at which the teeth on the wheel are cut has been found to have a detrimental effect on the working of the meter, so much so that binding has resulted, and undue wear takes place on the worm, resulting in failure of the recording mechanism.

It will be noticed that no mention has been made of the materials from which the outside casing of the meter is made, but it should be specially mentioned that this is a matter of the utmost importance, considering that any defective material will result in a serious leak in a very short time of working. To obviate this trouble, all tinplates and materials are carefully inspected, in order to reject material in which the smallest defect is apparent.

The methods used in producing the necessary stampings are designed so that the protective coating of tinplate is not removed, and any parts which are subject to heavy mechanical treatment should afterwards be carefully retinned to avoid corrosion.

At the conclusion of the paper, Mr. H. P. LUPTON (Liverpool) and Mr. J. W. CARLTON (Shipley) respectively moved and seconded a hearty vote of thanks to the author, to which Mr. BUTTERWORTH replied.

Cambridge Gas Order

Proposal to Acquire the Cottenham Gas Company

At the Offices of the Board of Trade in London on Thursday, March 10, the Director of Gas Administration—Mr. J. F. RONCA—held an inquiry into an application by the Cambridge University and Town Gaslight Company for a Special Order under the Gas Undertakings Acts, 1920 and 1929.

Mr. Jacques Abady appeared for the Gas Company, and Mr. R. A. Selborne Stringer (Deputy Clerk to the Cambridgeshire County Council) appeared in opposition on behalf of that body.

Mr. ABADY, in opening the case, said the main object of the Order was to acquire the non-statutory undertaking of the Cottenham Gas and Water Company, so far as the gas portion of that business was concerned. The actual purchase would be made from the Chesterton Rural District Council which was acquiring the Cottenham Company, but was debarred, in the absence of special Parliamentary powers, from carrying on a gas undertaking. The Order also necessarily extended the limits of supply of the Cambridge Company to the extent of the area supplied by the Cottenham Company. A provision was in the Order that the charge in Cottenham should not exceed 5d. per therm above the ruling price in Cambridge, and the reason for that was the necessity for laying some 5000 yards of 6-in. main to connect up with the supply from the existing Cambridge Works, it being uneconomical to continue the works of the Cottenham Company. This main, together with the cost of purchase of the Cottenham undertaking, would involve an expenditure of over £4000, and as the consumption was small in Cottenham it was necessary to have this differential. The maximum price which could be charged by the Cambridge Company was 14·8d. per therm, but the actual charge was 8d. per therm, so that on the present basis the charge in Cottenham would be 1s. 2d. per therm. The present price in Cottenham was 1s. 1d. per therm, so that there would be an immediate reduction of 1d. per therm, *plus* a better service and a better quality gas. There was no opposition to any of the provisions of the Draft Order, but the Cambridgeshire County Council was asking the Board to insert provisions for its protection as the Highway Authority, which, however, involved no alteration in the general law; and the Company objected to that being done. The proposals of the County Council seemed to be based partly on an improper comprehension of existing legislation on the point, and partly with a desire to alter the general law. Moreover, he gathered that the County Council's proposals were intended to apply not only to the small extension of area, but to all the existing area of supply of the Company. He contended that nothing contemplated under the Order constituted such a change of circumstances as to warrant anything being done which would justify the Board imposing conditions which were a change in the general law.

Mr. STRINGER, interposing, said the County Council's proposals for its protection related solely to the area now proposed to be added to the Company's limits of supply.

Mr. ABADY said this was not clear from the notice of objection, but he was glad to hear that. Nevertheless, he objected all the same to the proposals of the County Council being applied to the extension of area. The whole of the points raised by the County Council had been dealt with by the Committee set up in 1925 to deal specifically with the Northampton Order, and the decision in that case was that there should be no alteration of the general law. The one change that was made in that case, by agreement with the promoters, was that the County Council should be given 14 days' notice of the Gas Company's intention to open the roads with the exception of service openings; and he was prepared to accept that in the present case. Beyond that, however, he was instructed the Cambridge Company could not possibly go. There was already an arrangement between the Cambridge Gas Company and the County Council whereby the latter re-instated roads that had been excavated in connection with gas mains and charged the Company with the cost, and no difficulty had arisen. Indeed, the relations between the Company and the Council were most cordial.

Mr. STRINGER, putting the proposals of the County Council before the Director, reminded him that the existing legislation relating to gas companies and highway authorities was framed 85 years ago at a time when road making and road traffic were entirely different from what they are to-day. The County Council was seeking the protection it was asking for solely in the interests of the ratepayers, and he pointed out that the clauses now suggested had been inserted, by agreement, in the Hertfordshire, Bedfordshire, and Huntingdon Electricity Act of 1905, and had worked admirably in all three counties. The first proposal of the County Council was that the depth of mains should be approved by a representative of the Council. The next was that any works should be carried out to the reasonable satisfaction of the County Surveyor. Then the existing law dealt only with lighting at night and fencing and guarding trenches, but it did not deal with obstruction to traffic. Protection in this respect was asked for. In the same clause the question of statutory authorities constantly breaking up the roads one after the other was dealt with. The County Council had a form which was being used with great satisfaction at the present time, on which statutory authorities were told of the road repairs that were contemplated during the coming year, and they were asked to state what works they were likely to be carrying out during the same period in the same roads, and to arrange as far as possible to do this work before the County Council carried out its repairs. He was surprised there should be any objection to that, because the scheme was working well at the present time. Then there was the question of the 14 days' notice which the Company had agreed to, subject to its not applying to services. Another clause which the County Council asked for related to widening or altering the level of streets, concerning which there was nothing in the existing law. Yet another clause dealt with possible claims against the County Council in respect of works being carried out by the Gas Company, and there was nothing in the existing law which indemnified the County Council.

Mr. ABADY said he could not agree to that. Using the word "indemnify" in the widest sense, the Company was respon-

sible at common law for any damage caused by its works, where negligence was proved.

Mr. STRINGER, continuing, said the County Council next asked for protection against claims for damage caused to gas mains by the use of steam rollers or scarifiers as long as these were used with proper care. Finally, it was asked that all matters in dispute between the County Council and the Company should be settled by arbitration.

Mr. ABADY, replying for the Gas Company, repeated his general objection to these proposed clauses for the reason that they altered the general law and should not be made in respect of an undertaking which was merely seeking to extend its area by a few square yards. Where any modification of the general law had been made it was always by agreement, and the Cambridge Company could not agree in the present instance. Dealing with some of the proposed clauses in detail, he said many difficulties might arise if the County Council had the right to say at what depth mains should be laid. Mains could not be laid at the same depth in all positions, because there was the question of draining moisture into the syphons to be considered. At present, if the County Council took any objection, the matter was settled by two Justices; but under the proposals now made it would have to go to arbitration, a costly and lengthy procedure. Again, it was asked that the works should be completed to "the reasonable satisfaction" of the County Surveyor, and that could lead to all sorts of difficulties and delays. Quite apart from the fact that these proposals altered the general law, he failed to see that they would be of any use to anybody, and he maintained that the present law gives the County Council adequate protection.

The inquiry then closed, and the decision of the Board of Trade will be announced in due course.

Parliamentary Intelligence

[From Our Special Correspondents.]

House of Lords.

Gas Undertakings Bill.

A Bill to amend the law with respect to gas undertakings was presented on March 10 by Viscount Mersey, on behalf of Viscount Bridgeman, read a first time, and put down for second reading. The object of the Bill is to empower gas undertakers to invest in the securities of other companies or local authorities engaged in the gas or allied industries, provided that the aggregate amount of such investments shall not exceed one-tenth of the authorized capital. It would have the effect of making general powers similar to those frequently obtained by individual gas undertakers by means of Private Bills.

Special Orders.

Special Orders on application of the Nantwich Urban District Council and of the Harrogate Gas Company have been laid before the House and referred to the Special Orders Committee.

House of Commons.

Private Bills.

The Kettering Gas Bill was read a second time on March 14.

The objection to the Commercial Gas Bill on the part of Mr. George HICKS, M.P. for East Woolwich, and other M.P.s has been withdrawn, and the Bill has passed its second reading without debate and has been referred to the Examiners of Petitions for Private Bills.

Special Orders.

Special Orders on the application of the Nantwich Urban District Council and of the Harrogate Gas Company have been presented and ordered to lie on the table of the House.

Legal Intelligence

Rights of a Co-Partner.

Action Against South Metropolitan Gas Company.

In our columns last week (p. 616) we reported the case of Mr. Isaac Danson against the South Metropolitan Gas Company, the plaintiff asking for a declaration that the Company was under an obligation to renew an agreement with him in regard to its co-partnership and pension scheme. The case was heard on March 4 by Mr. Justice McCardie (not Mr. Justice Mackinnon, as stated). Our report contained two further errors. The plaintiff had been in the service of the Company from 1919 till January, 1931, when his services were dispensed with because of re-organization of the staff, and the pension he was granted amounted to £91 per annum, and not £250 as stated in our issue of March 9.

The Judgment.

The judgment of Mr. Justice McCardie is an important one, and we take the following extract from the "Kentish Mercury" for March 11:

I doubt not that this case is of individual importance to the plaintiff. It certainly is a question of the gravest importance to the defendant Company. In my view there is no question to go to the jury at all, and I myself am unable to see upon the facts and documents here before me that there can be any cause of action by the plaintiff against the defendants. In my opinion it is quite clear that the contractual relation of master and man between the two parties came to an end at the conclusion of January, 1931. His formal agreement of service states that the plaintiff shall be entitled to the benefits and bound by the rules and conditions of the co-partnership so long as he shall continue in the service of the Company under the agreement. Therefore, upon the face of the document, it is made plain beyond measure that upon the determination of the twelve months provided for, there shall be a complete cessation of the relation between the two in the absence of further agreement.

There is certainly no agreement to renew. The implication of an agreement to renew which would cover apparently both sides would be destructive of the very wording of the document which says that it shall be a period of twelve months only. There is the agreement which is, I think myself, absolutely clear in its terms, and it was the only agreement of service betwixt them. It was the guiding dominating contractual obligation as between the two. Unless one took that view of this document, the most chaotic condition would be created.

Continuing, his Lordship agreed that there were other documents that had to be looked at in order to find the contractual relations between the parties, but this was the dominant document; the others were merely accidental. He also pointed out that there was no suggestion of misconduct on the part of the plaintiff; his health had obviously broken down for a number of years past, and the defendants had treated him with the greatest consideration—indeed, with generosity, as he admitted.

As to the other documents, the co-partnership scheme was dependent upon the continuance of the service agreement. If the service ceased, the rights of co-partnership ceased also. There was no doubt that the legislation that bore upon the matter supported the view he had expressed. If this co-partnership scheme were to extend the one year's agreement for an indefinite period of years, the whole matter would be thrown into absolute chaos. The co-partnership rules did not support the submissions on the part of the plaintiff. He had no doubt that the right to the benefits of the pension scheme must be dependent upon the continuation of the service agreement. He doubted whether plaintiff was in law entitled to the pension of £91, which the defendants were willing to give; he would hesitate greatly before holding that plaintiff was entitled to that pension.

His Lordship concluded: I can see no question for the jury. Here are the documents. There is no question of fact, and to my mind it is quite clear that the relations between the two parties ended at the conclusion of January, 1931, and that upon the conclusion of that service agreement between them all rights on the part of the plaintiff to any further pension benefits or any further partnership benefits ceased *in toto*. He had no right to sue for breach of agreement. I am glad to feel that he is entitled still, of course, to the accrued benefits under the partnership agreement, and therefore he gets either in stock or money a sum of close upon £200, but I entertain no doubt here for my own part that there must be judgment for the defendants.

He therefore entered judgment for the defendants, with costs.

Gas Acts (1920 and 1929) Orders.

DECLARATIONS OF CALORIFIC VALUE.

Cheltenham and District Gas Company.

470 B.Th.U. in Tewkesbury and certain Rural Districts.

Gravesend and Milton Gas Light Company.

500 B.Th.U., as from June 25.

Holywell and Flint (British Gas Light Company, Ltd.).

With a view to the supply of gas of the same calorific value to all consumers in the limits of supply of their Holywell and Flint undertaking, the Company intend, as from July 1 next, to supply gas of a calorific value of 500 B.Th.U. to such of the consumers in the said limits of supply as are at present being supplied with gas of 510 B.Th.U.

Wisbech Lighting Company.

500 B.Th.U., as from June 18 next.

Gas Companies' Results in 1931

Brighton, Hove, and Worthing.

The Annual General Meeting of the Brighton, Hove, and Worthing Gas Company was held at 5, Great Winchester Street, London—Mr. A. M. Paddon (Chairman of the Company) presiding. The Chairman stated that the capital account showed that the capital expenditure on the works now amounted to £568 per million c.ft. That was an improved figure, and he never omitted drawing attention to it, because it was the determining factor as to what was necessary to be raised by way of profit in order to satisfy the general financial obligations of the Company. A number of transactions had been carried out during the year, some of which had been distinctly favourable. For instance, the 7 p.ct. redeemable mortgage had been eliminated and the 4 p.ct. debenture stock had been merged in the 5 p.ct. perpetual stock, while the £10,000 "C" 4 p.ct. preference stock had been converted into "B" preference 6 p.ct. consolidated stock. This simplification of the capital was a distinct advantage. Turning to the Revenue Account, the Chairman said that in spite of the fact for the reasons he had mentioned, that the usual comparisons could not be made with the previous year, the final results must be considered as not unsatisfactory. The receipts had been increased by £54,000, and this amount was arrived at after proper and adequate depreciation and maintenance allowances, amounting to no less than 16d. per 1000 c.ft. He had said this on many previous occasions, namely, that the profit had not been reached until the efficiency of the undertaking as a whole had been carefully studied. The coal and oil figure was £25,000 more than in the previous year. Repairs and maintenance were just over £9000 less, and one outstanding figure was the allocation of £12,000 to the special purposes fund. In the profit and loss account it was seen that a special transfer of £10,000 had been made to the co-partners' contributory pensions fund. In the profit and loss account also £2175, part of the total of £19,577 involved in the costs of the acquisition of the Worthing undertaking, had been written off, and it was proposed to liquidate these total costs gradually in subsequent years. Dealing with some of the particular items in the balance-sheet, it was pointed out that of the £77,000 to the credit of the co-partners' contributory pensions fund, there was only a small balance of £360 uninvested. The co-partnership fund had grown to over £75,000 in the twelve years it had been in existence, and during all that time the co-partners had afforded the Company a measure of support and loyal co-operation worth every farthing that the Company had contributed to the fund.

Bromsgrove.

The Annual Meeting of the Bromsgrove Gaslight and Coke Company was presided over by Mr. J. G. Green. The Directors reported that the profit and loss account, including the balance of £2965 brought forward, showed after paying interest on debenture bonds, &c., and transferring £162 to reserve contingent account, and providing for interim dividends paid in September a balance of £4139. The Directors recommended the payment of dividends of 10 p.ct. on the original shares and 7 p.ct. on the "B" shares for the year, and at the rate of 7 p.ct. per annum for the half-year on the "B" shares (new issue), leaving a balance to be carried forward to next year's accounts of £2766. The report was adopted and dividends were declared as recommended. The Chairman stated there had been a satisfactory increase in the demand for gas.

Canterbury.

Gas and water are both to be cheaper for consumers of the Canterbury Gas and Water Company. As from the last meter readings, gas will be reduced by ½d. per therm. These reductions were announced at the Annual Meeting of the Canterbury Gas and Water Company, when it was resolved that the dividend should be increased from 9 p.ct. to 10 p.ct. Owing to the exceptionally mild weather experienced during the present winter, said the Chairman (Mr. Silas Williamson), moving the adoption of the report, the sales of gas had declined by 2 p.ct., which was less than might have been expected under the circumstances, as the demand varied daily with the rise and fall of the thermometer. The Company had connected 135 new services, and supplied many additional cookers and gas fires during the past year; while 2327 yards of new 4-in. mains were laid. Altogether this department had a very favourable year, and is able to carry to profit and loss account £8654, against £5251 for 1930. There has been a very welcome decrease in the amount of gas unaccounted for, always an uncertain quantity in old companies' mains and services. For the past ten years this has averaged up to 8·69 p.ct., but this year it has been the lowest on record, standing at 5·82 p.ct. The gas made per ton of coal carbonized has improved by 669 c.ft. to the ton, owing to the more uniform and better quality of coal received, as well as the renewal of retorts and furnaces. Residuals altogether have realized £233 more than last year, in spite of the profit on the making of sulphate of ammonia having practically vanished.

Cleveland.

The Directors of the Cleveland Gas Company, in their half-yearly report to the shareholders, state that for the second year in succession the flooding of Kilton Beck caused severe damage to the Company's gas-works at Skinningrove. The repairing of the damage to the premises by the flood last September cost the Company £193. Steps are being taken to induce the owners of the lands further to try to prevent the recurrence of flooding. The profit made during the half-year was £718, exclusive of flood damage repairs, to which was added £3665, making a total of £4384. A dividend of 3 p.ct. will be paid, £100 added to the contingent fund, and £3686 carried forward.

Hastings.

Mr. A. M. Apel presided at the Annual Meeting of the Hastings and St. Leonards Gas Company, which is this year celebrating its centenary. Moving the adoption of the report, he said: The cost of coal, oil, and coke at £58,546 is about £1050 in excess of last year. This is partly due to a slight increase in the price of coal, but principally through the additional amount of gas made. Repairs and maintenance of works and plant at £19,549 shows a decrease of £1587. Repairs, maintenance, and renewal of mains, &c., at £3083 is much the same in amount as for 1930. This also applies to the £14,319 for repairing, renewing, and refixing meters, stoves, and depreciation. The amount received from sales of gas is £116,480—an increase over the previous year of £2140. As the price of gas remains the same as in the previous year, this increased amount is entirely due to additional business. Rentals for meters and stoves at £14,655 also shows an increase, due to the same cause. The result of the year's working leaves us with a balance of £28,088. Gas sold reached the record total of 601,744,100 c.ft. The unaccounted-for gas equalled 4·02 p.ct. We sold during last year 1017 new appliances, which is an increase over the previous year. Interim dividends (less income-tax) were paid in September as follows: £7 p.ct. per annum on the 5 p.ct. converted stock; £5 10s. p.ct. per annum on the 3½ p.ct. converted stock; £6 8s. p.ct. per annum on the 5 p.ct. additional stock, and the Directors recommended final dividends for the year at the same rates.

Seaton.

The annual report of the Seaton (Devon) Gas Company states that the sales of gas show a gratifying increase, due in a measure to the highly successful exhibition held early in the year. While the plant and works have been kept in a state of efficiency, and improvements effected, the profits have been fully maintained, and the Directors recommend payment of a dividend of 7 p.ct., less tax.

Sevenoaks.

Mr. David Pugh (Chairman) presided at the Annual Meeting of shareholders of the Sevenoaks Gas Company, and in moving the adoption of the report and balance-sheet he said: The gross profit for the year amounts to £7124, and the profit and loss account shows that, after providing for debenture and other interests, and the interim dividend, there is a balance of £12,297 available for dividends, and the Directors recommend that dividends at the following rates be declared: 10 p.ct. on "A" shares; 7 p.ct. on "B" shares (including the interim dividend already paid), both less tax. This will absorb £1689, leaving £10,838 to be carried forward to the next account. The output of gas shows an increase of 2 million c.ft.; this was during the first six months of the year, and is largely due to the 157 new consumers connected during the year. The return for gas is £712 less than last year, and is mainly due to the introduction of the "block" system, which has proved a success by encouraging consumers to make fuller use of gas. There are items of expenditure which show an advance on last year, especially coal, but in view of the financial crisis all expenses for repairs and maintenance have been cut down to the lowest figure consistent with safety, and show a reduction of £3500. Thus we have been able to maintain and even slightly increase our profits.

Sittingbourne.

The profit for the year of the Sittingbourne District Gas Company amounts to £5010. To this has to be added the unappropriated balance from the previous year of £6639, and bank interest of £15, making together £11,665. Against this has to be charged mortgage interest, £625, and income-tax (balance), £972, leaving for disposal, £10,068, which the Directors recommend shall be applied in the following manner—viz.: In paying dividends (less tax) for the year ended Dec. 31, 1931, on the original ordinary shares at 7½ p.ct., on the additional ordinary shares at 5¼ p.ct., and by carrying forward to the current year the balance of £6663. The gas sales for the year show an increase of 9409 therms over those of the previous year.

South Staffordshire Mond.

The amount of fuel gasified by the South Staffordshire Mond Gas Company during the year is 12 p.ct. less than last year, while the cost of fuel gasified is 13 p.ct. less than for 1930. The gas distributed during the year is 11½ p.ct. less than during 1930. The gross profit for the year is £13,217, and deducting prior lien and debenture stock interest amounting to £12,916, a net profit for the year of £301 remains. A sum of £21,728 has been brought forward from the previous year, which makes the amount of undivided profit standing to the credit of the profit and loss account at Dec. 31, 1931, £22,029. The Directors have carefully considered the question of paying the preference dividend for the year 1930, and they are of opinion that it is still necessary to conserve the financial resources of the Company. They do not, therefore, recommend the payment of any dividends.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

There was slightly less activity on the Stock Exchange last week, particularly towards the close, though this was due mainly to the closing of a heavy account and not to any return of weakness. Gilt-edged stocks continued in demand, and, consequent on the reduction in the Bank Rate from 5 to 4 p.ct., other fixed-interest-bearing securities, especially those in the preference group, rose in value.

Business in Gas stocks and shares, however, showed no signs of abatement, and any stock coming into the market was speedily absorbed. Contrary to the experience in other sections of the House, the rise in values was by no means confined to preference and debenture issues, though many of these continued to show considerable improvement. As is usual after the dividend payments there were larger supplies of ordinary stocks available, and such was the demand that the prices of several of these issues hardened. Among those to show improvement, Portsmouth 5 p.ct. gained 5 points to 80½; and this price is still low when compared with other maximum dividend stocks in the List. South Suburban rose 4 points to 104½, and North Middlesex and Liverpool both gained 3 points to 110½ and 99½ respectively. South Metropolitan and East Surrey each improved 2 points, and several others showed smaller gains. Among preference stocks, it is satisfactory to note that South Metropolitan 6 p.ct., which improved 5 points to 112½, is now only 2 points below the price at which it stood prior to the financial crisis in September last when it was marked down to 105. Brighton 6 p.ct. "B" preference rose 2 points to 107½, and Newcastle 4 p.ct. preference gained 2½ points to 70 (at the local Exchange). Debenture stocks were again prominent. East Surrey headed the list with a rise of 6 points to 98½, with South Suburban next with a gain of 4 points to a similar level; and it will be seen from the Stock and Share List that many others hardened from 1 to 3 points. The only reduction in value last week was in Gas Light £1 units which declined 3d. to 20s. 3d.

The Directors of the Imperial Continental Gas Association have announced that they propose to distribute a capital bonus of 100 p.ct. by doubling the present issued capital of £2,800,000. The new stock represents part of the surplus disclosed on a revaluation of the Company's assets and will rank for final dividend for the year to March 31 next. It will be remembered that in 1921 the Company returned 60 p.ct. of the then issued capital from the proceeds of the realization of its German assets, and from the same source has distributed in bonus since that date: In 1923, 12 p.ct.; 1924, 10 p.ct.; 1925, 19½ p.ct.; and in 1926, 8½ p.ct. The Directors recommend a final dividend for the current year of 7 p.ct. on the doubled capital which, with the interim dividend of 7½ p.ct., is equivalent to 21½ p.ct. for the year on the present capital (against 20 p.ct. for 1930-31), or 10¾ p.ct. for the year on the proposed new capital. The stock has risen 20 points during the past two weeks, and at the present price of 370 gives a yield on the present capital of £5 16s. 2d. p.ct.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *March* 14.

There is no change in the values of tar products, which remain as follows:

Pitch is firm at about 95s. per ton f.o.b.

Creosote, for export, varies from 3¾d. to 5d. per gallon f.o.b., according to specification.

Refined tar is 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 9d. per gallon at makers' works; pure benzole, 1s. 8d. to 1s. 9d. per gallon; 95/160 solvent naphtha, about 1s. 5d. per gallon; and pyridine bases, about 3s. 9d. to 4s. per gallon.

Tar and Tar Products in the Provinces.

March 14.

The average prices of gas-works products during the week were: Gas-works tar, 42s. to 47s. Pitch—East Coast, 85s. to 90s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. to 90s. f.o.b.* Toluole, naked, North, 1s. 10½d. to 1s. 11d. Coal-tar crude naphtha, in bulk, North, 5d. to 5½d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 11d. to 11½d. Creosote, *ex* works, in bulk, North, liquid, and salty, 3½d. to 3¾d.; low gravity, 1¾d.; Scotland, 3½d. to 3¾d. Heavy oils, in bulk, North, 5d. to 5½d. Carbolic acid, 60's, 1s. 7½d. to 1s. 8d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *March* 12.

Trading continues on moderate lines with prices of most products firm in tone.

Crude gas-works tar.—Actual value is firm at 52s. 6d. to 57s. 6d. per ton *ex* works.

Pitch.—Export price is nominal at 80s. to 85s. per ton f.o.b. Glasgow. In the home market, 82s. 6d. to 85s. per ton *ex* works is obtainable.

Refined tar to Ministry of Transport Specification continues firm at 4⅜d. to 4⅝d. per gallon f.o.r. makers' works in buyers' barrels.

Creosote oil.—A fair volume of business is passing, and prices are steady. B.E.S.A. Specification is 3d. to 3¼d. per gallon; low gravity, 3⅜d. to 4d. per gallon; and neutral oil, 3⅝d. to 3¾d. per gallon—all *ex* works in bulk.

Cresylic acid.—Inquiries are scarce, and prices are weak. Pale, 97/99 p.ct., is 1s. 1¾d. to 1s. 2¼d. per gallon; dark, 97/99 p.ct., 1s. 0¼d. to 1s. 1¼d. per gallon; and pale, 99/100 p.ct., 1s. 3¼d. to 1s. 4d. per gallon—all f.o.r. naked.

Crude naphtha.—Production is low and the value is steady at 4¾d. to 5d. per gallon, according to quality and district.

Solvent naphtha.—There is very little demand. 90/160 is 1s. 3d. to 1s. 4d. per gallon, and 90/190 1s. to 1s. 1d. per gallon.

Motor benzole.—Quotations are unchanged at 1s. 3d. to 1s. 4d. per gallon in bulk *ex* works.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade, 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	7	to	0	7½	per gallon at works
Motor "	1	2	"	1	3	" " "
Pure "	1	6	"	1	7	" " "

Contracts Advertised To-Day.

Coal.

The Hoylake and West Kirby Urban District Council invite tenders for the supply of gas nuts. [Advert. on p. 690.]

Vertical Retort Plant, &c.

The Gas Committee of the Gainsborough Urban District Council invite tenders for a continuous vertical retort plant and house. [Advert. on p. 690.]

Trade Notes.

New Gasholder for Londonderry.

The City of Londonderry Gas Light Company has placed an order with Messrs. Firth Blakeley, Sons, & Co., Ltd., of Vulcan Ironworks, Church-Fenton, Yorks., for a three-lift spiral-guided gasholder of 472,000 c.ft. capacity, to be fitted with their patent "Vulcan" ball-thrust carriages.

An Amalgamation.

The businesses formerly carried on by Hans Renold, Ltd., at the Renold Works, Didsbury, Manchester, and the Coventry Chain Company, Ltd., at the Coventry Chain Works, Spon End, Coventry, will be taken over by the Renold and Coventry Chain Company, Ltd., which will conduct its trading operations from the same addresses as the present companies.

Continuous Vertical Retorts.

The Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., have received an order from the Wisbech Lighting Company for an installation comprising one bench of four 53-in. Woodall-Duckham continuous vertical retorts, to be heated by two producers situated at ground-floor level at one side of the bench. The existing retort house, which already contains a bench of six retorts of similar size, will be extended to accommodate the new installation. The coal and coke handling plant on the existing bench is to be adapted to serve the new installation as well as the old.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier pages.]

Issue	Share.	When ex-Dividend.	Dividends. Prev. Yr.	Dividends. Last Yr.	NAME.	Quotations. Mar. 12. (Provincial Exchanges Mar. 11.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Oct. 5	7⅞	7⅞	Alliance & Dublin Ord. ...	105—110	+1	108⅜—109⅞
374,000	..	Jan. 4	4	4	Do. 4 p.c. Deb. ...	65—70	...	...
557,655	..	Aug. 24	7	7	Barnet Ord. 7 p.c.	120—125	...	124½
300,000	1	Oct. 19	1/9⅔	1/4⅓	Bombay, Ltd.	15/—20/-	+1/3	17/6—17/9
177,750	10	Feb. 29	9	9	Bournemouth 5 p.c. ...	14½—15½	...	...
500,050	10	..	7	7	Do. B 7 p.c. ...	12—13	...	12⅝—12⅞
439,160	10	..	6	6	Do. Pref. 6 p.c. ...	11—12	+⅛	11½—11⅝
50,000	Stk.	Dec. 14	3	3	Do. 3 p.c. Deb. ...	57—62	+2	...
162,025	..	..	4	4	Do. 4 p.c. Deb. ...	77—82	...	...
210,000	..	..	5	5	Do. 5 p.c. Deb. ...	99—104	+1	...
					Brighton, Hove, & Worthing			
357,900	..	Aug. 24	7½	7½	6 p.c. Con. ...	115—120	+1	117—120
540,000	..	..	6⅔	6⅔	Do. 5 p.c. Con. ...	105—110	+1	107—110
195,500	..	..	6	6	Do. 6 p.c. B Pref.	105—110	+3	...
1,287,500	..	Feb. 29	5	5	Bristol 5 p.c. max.	90—92ᵃ	+1	...
120,420	..	Jan. 4	4	4	Do. 1st 4 p.c. Deb. ...	77—79ᵃ	...	...
217,870	..	..	4	4	Do. 2nd 4 p.c. Deb. ...	77—79ᵃ	...	...
328,790	..	..	5	5	Do. 5 p.c. Deb.	97—98ᵃ	...	...
855,000	..	Oct. 5	8	7	British Ord.	110—115	...	115
100,000	..	Jan. 4	7	7	Do. 7 p.c. Pref.	110—115	...	...
120,000	..	..	4	4	Do. 4 p.c. Red. Deb. ...	75—80	...	...
450,000	..	..	5	5	Do. 5 p.c. Red. Deb. ...	95—100	...	...
160,000	..	Jan. 4	5	5	Cambridge 5 p.c. Deb. ...	95—100	...	...
100,000	10	Nov. 30	8	6	Cape Town, Ltd.	8½—9½	...	...
100,000	10	Oct. 30	4½	4½	Do. 4½ p.c. Pref. ...	6¾—7¼	...	...
150,000	Stk.	Jan. 4	4½	4½	Do. 4½ p.c. Deb. ...	65—70	...	69—70
626,860	..	Feb. 15	6	6	Cardiff Con. Ord.	93—96	...	...
237,860	..	Jan. 4	2½	5	Do. 5 p.c. Red. Deb.	95—100	...	...
157,150	..	Feb. 15	5	6½	Chester 5 p.c. Ord.	84½—89½	...	...
98,936	1	Oct. 5	12/-	2/-	Colombo, Ltd. Ord.	27/—32/-	...	...
24,500	1	..	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	17/—19/-	...	...
609,204	1	Oct. 19	1/3'27	/10'90	Colonial Gas Assn. Ltd. Ord.	10/—15/-	...	...
296,053	1	..	1/5'67	1/2'54	Do. 8 p.c. Pref.	10/—15/-	...	...
2,073,280	Stk.	Feb. 15	6	5½	Commercial Ord.	95—98	...	96½—97
475,000	..	Dec. 14	3	3	Do. 3 p.c. Deb. ...	56—61	...	58
807,560	..	Feb. 15	7	7	Croydon sliding scale	107—110	...	...
169,590	..	..	5	5	Do. max. div.	80—83	...	...
500,000	..	Jan. 4	5	5	Do. 5 p.c. Deb.	99—102	...	100½—101½
542,270	..	Feb. 29	7	10	Derby Con.	117—122ᶜ	...	...
55,000	..	Jan. 4	4	4	Do. Deb.	65—70ᶜ	...	...
209,000	..	Sept. 7	5	5	East Hull Ord. 5 p.c. ...	71—76	...	...
179,500	..	Feb. 29	5½	5½	East Surrey Ord. 5 p.c. ...	90—95	+2	92—92½
155,019	..	Jan. 4	5	5	Do. 5 p.c. Deb. ...	96—101	+6	...
1,002,180	..	Sept. 21	16½	14	European, Ltd.	105—115	...	107½—110
49,405,992	..	Feb. 15	5¾	5¾	Gas Light & Coke 4 p.c. Ord.	19/9—20/9/	—/3	19/10½—20/7½
2,600,000	..	..	3½	3½	Do. 3½ p.c. max.	58—63	...	62—63
4,477,106	..	..	4	4	Do. 4 p.c. Con. Pref. ...	78—82	+1	79½—82
6,102,497	..	Dec. 14	3	3	Do. 3 p.c. Con. Deb. ...	60—63	...	61½—62½
3,642,770	..	..	5	5	Do. 5 p.c. Red. Deb. ...	100—103	+1½	100—101
2,500,000	..	..	4½	4½	Do. 4½ p.c. Red. Deb. ...	89—92	+1	90
162,280	..	Feb. 29	10	10	Harrogate Cons. 10 p.c. max.	157—162	...	...
82,500	..	Aug. 24	7	7	Hastings & St. L. 5 p.c. Conv.	95—100	...	...
258,740	..	..	5½	5½	Do. 3½ p.c. Conv.	81—86	...	84
70,000	10	9 Oct. '30	—	10	Hongkong & China, Ltd. ...	11—12	...	...
213,200	Stk.	Feb. 29	6	6	Hornsey Con. 3½ p.c. ...	87—90ˣ	...	...
2,800,000	..	Oct. 30	25	15	Imperial Continental Cap.	360—380	+5	375—380
223,130	..	Feb. 1	3½	3½	Do. 3½ p.c. Red. Deb.	68—73	...	72
235,242	..	Aug. 10	8½	8½	Lea Bridge 5 p.c. Ord. ...	129—132	...	...
2,145,907	..	Feb. 29	6	6	Liverpool 5 p.c. Ord. ...	99—100ᵇ	+3	...
245,500	..	—	—	5	Do. 5 p.c. Red. Pref. ...	94—99ᵇ	...	...
306,083	..	Jan. 15	4	4	Do. 4 p.c. Deb. ...	78—80ᵇ	...	...
165,786	..	Feb. 15	8	10	Maidstone 5 p.c. Cap. ...	124—129	...	...
56,176	..	Jan. 4	3	3	Do. 3 p.c. Deb. ...	55—60	...	...
75,000	5	Nov. 30	110	110	Malta & Mediterranean ...	6¼—7	...	...
					Metropolitan (of Melbourne)			
892,000	—	Oct. 1	5½	5½	5½ p.c. Red. Deb.	78—83	...	...
171,978	Stk.	Feb. 29	5	5	M. S. D. Utility "C." Cons.	76—81	...	...
718,657	..	..	4	4	Do. 4 p.c. Cons. Pref.	67—72ˣ	...	...
112,126	..	g	4	4	Do. 4 p.c. Deb. ...	70—75	...	...
148,955	..	g	5	5	Do. 5 p.c. Deb. ...	95—100	...	...
675,000	..	May 21	16	16	Montevideo, Ltd.	70—80	...	...
2,061,316	..	Feb. 29	5	5½	Newcastle & Gateshead Con.	16/6—17/6d/	+/3	...
682,856	..	..	4	4	Do. 4 p.c. Pref. ...	69—71ᵈ	+2½	...
691,705	..	Jan. 4	3½	3½	Do. 3½ p.c. Deb. ...	67—68ᵈ	...	...
277,285	..	Oct. 30	5	5	Do. 5 p.c. Red. Deb.	96—98ᵈ	...	...
199,940	..	Aug. 24	7½	7½	North Middlesex 6 p.c. Con.	108—113	+3	...
396,160	..	Feb. 15	5	5	Northampton 5 p.c. max. ...	72—77	...	...
300,0 0	..	Nov. 30	7	9	Oriental, Ltd.	88—98	...	...
60,000	5	13 May, '15	—	—	Ottoman	0—¼	...	...
205,162	Stk.	Jan. 4	8	8	Plym'th & Stonehouse 5 p.c.	113—118	...	116—118
504,416	..	Feb. 15	8	8	Portsm'th Con. Stk. 4 p.c. Std.	116—121	...	...
241,446	..	..	5	5	Do. 5 p.c. max. ...	78—83	+5	...
686,312	..	Jan. 18	4	4	Primitiva 4 p.c. Rd. Db. 1911	77—82	...	...
389,813	..	Jan. 4	4	4	Do. 4 p.c. Cons. Deb.	77—82	...	...
150,000	10	Sept. 21	6	6	San Paulo 6 p.c. Pref. ...	72—73	...	...
1,736,968	Stk.	Sept. 7	6½	6	Sheffield Cons.	103—105ᵉ	...	...
95,000	..	Jan. 18	4	4	Do. 4 p.c. Deb.	79—81ᵉ	...	...
133,201	..	Feb. 29	8½	5	Shrewsbury 5 p.c. Ord. ...	88—93ˣ	...	...
90,000	10	June 11	15	15	South African	3—5	...	...
6,709,895	Stk.	Feb. 15	5	7	South Met. Ord.	101—104	+2	101—103½
1,135,812	..	..	6	6	Do. 6 p.c. Irred. Pf.	110—115	+5	110 115
1,895,445	..	Jan. 4	3	3	Do. 3 p.c. Deb. ...	59—62	...	60—62
1,000,000	..	Jan. 18	4	5	Do. 5 p.c. Red. Deb.	99—103	+1	101—102
91,500	..	Aug. 10	8½	8½	South Shields Con.	120—125ᵈ	...	...
1,543,795	..	Feb. 15	6½	6	South Suburban Ord. 5 p.c.	102—107	+4	103—105
668,837	..	Jan. 4	5	5	Do. 5 p.c. Deb.	96—101	+4	100
647,740	..	Feb. 29	5	5	Southampt'n Ord. 5 p.c. max.	74—79ˣ	...	...
121,275	..	..	4	4	Do. 4 p.c. Deb.	75—80	+3	...
250,000	..	Aug. 24	7	7	Swansea 7 p.c. Red. Pref. ...	96—99	...	...
200,000	..	Jan. 4	6½	6½	Do. 6½ p.c. Red. Deb.	98—101	...	...
1,076,490	..	Feb. 29	6½	6½	Tottenham and District Ord.	104—108ˣ	...	106—107
300,000	..	..	5½	5½	Do. 5½ p.c. Pref. ...	93—98ˣ	...	...
199,005	..	Dec. 14	4	4	Do. 4 p.c. Deb. ...	75—78	...	...
85,701	..	Sept. 21	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	72—77	...	...
					Uxbridge, Maidenhead, &			
346,069	..	Feb. 29	7	7	Wycombe 5 p.c.	100—105ˣ	...	...
88,330	..	..	5	5	Do. 5 p.c. Pref. ...	87—92ˣ	...	...
					Wandsworth and District:			
1,322,220	..	Feb. 29	7	7	Consolidated	112—117ˣ	...	115—115½
971,373	..	..	5	5	Do. 5 p.c. Pref.	93—98ˣ	+1	95½—97
1,167,964	..	Jan. 4	5	5	Do. 5 p.c. Deb.	97—102	+1	101

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g* The interest due 1/1/32 was paid on that date. ˣ Ex. div. † Paid free of income-tax. ‡ For year. § Div. =10 p.c. p.a. less tax and less tax on interim dividend.

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Prospectus and Forms of Tender (which latter must be sent in by 4 p.m. on Thursday, the 24th of March) may be obtained from the SECRETARY, Mr. F. VALLINS, at the COMPANY'S OFFICES, OAK LANE, SEVENOAKS, KENT.

(This announcement is inserted gratuitously.)

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With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

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Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

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CONTENTS

EDITORIAL NOTES.

A GLANCE AT THE CONTENTS . . . 719
Better Service 720
In Times of Stress 720
"Putting the Clock Back" 721

Forthcoming Engagements 719
1932 "JOURNAL" Directory 719
"Assessment of Gas Undertakings" . . . 721
Personal—
C. H. Chester 722
Obituary—
Archibald Dougall 722

CORRESPONDENCE.

Development in Gas Fire Design 722
New Use for Gas 723

NEWS OF THE WEEK.

Paragraphs 724
Institution of Gas Engineers—Short Gas Course for Teachers 724
Gas in Princess Elizabeth's Miniature House 724

NEWS OF THE WEEK—(*continued*).

"Missionaries of Smoke Abatement" . . 725
National Joint Industrial Council for the Gas Industry—Visit to Watson House . . . 725
Gas Burner Maintenance 726
Street Lighting and Safety 726
International Gas Union 726
South Yorkshire Coke Oven Gas Grid . . 726
Dover Gas Company Supper 728
Gas Engines for Sewage Works 728
An American Year Book of Merit 728
Gas Potential Investments 728

SPECIAL ARTICLES, &c.

Reviews 723
The Fuel for Hotel Comfort 727
New Note in Gas Display 729

"JOURNAL" TECHNICAL RECORD.

Manchester District Association of Gas Engineers—
General Business 730
Presidential Address of Mr. C. W. Ward . 731
Western Junior Gas Association—
Dry Gas Meter Design. By J. H. Bingham, M.I.Mech.E.—Discussion 735

"JOURNAL" TECHNICAL RECORD—(*continued*).

Southern Association of Gas Engineers and Managers—
General Business 736
Business Meeting 736
Presidential Address of Mr. R. H. Ruthven 737

MISCELLANEOUS.

"Turbine" Furnaces 741
The European Gas Company, Limited—Annual General Meeting 742
Gas Companies' Results in 1931 . . . 744-6-7
Radiation Limited—Ordinary General Meeting 745
Parliamentary Intelligence 747
Trade Notes 748

GAS MARKETS AND MANUFACTURES.

Stock Market Report 748
Current Sales of Gas Products 748
Contracts Advertised To-Day 748

Stock and Share List 749

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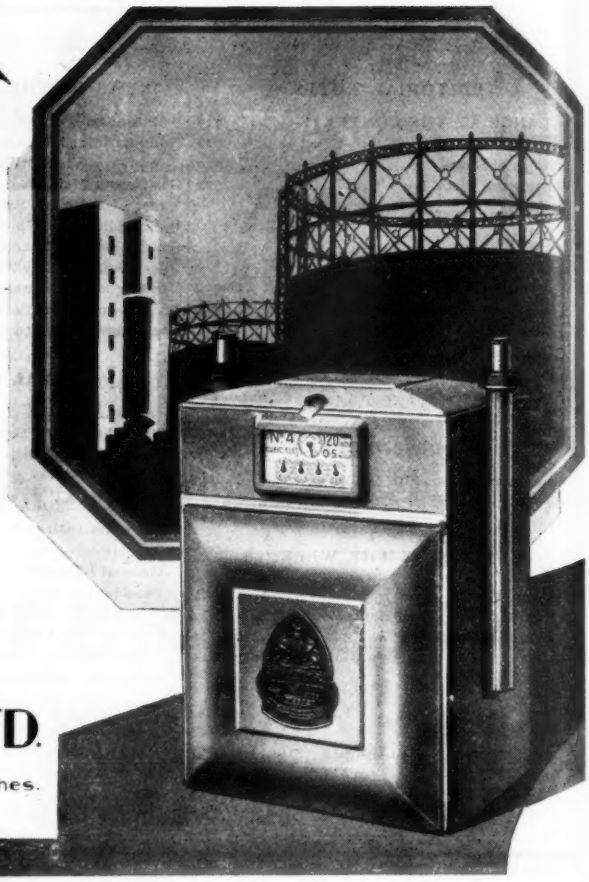

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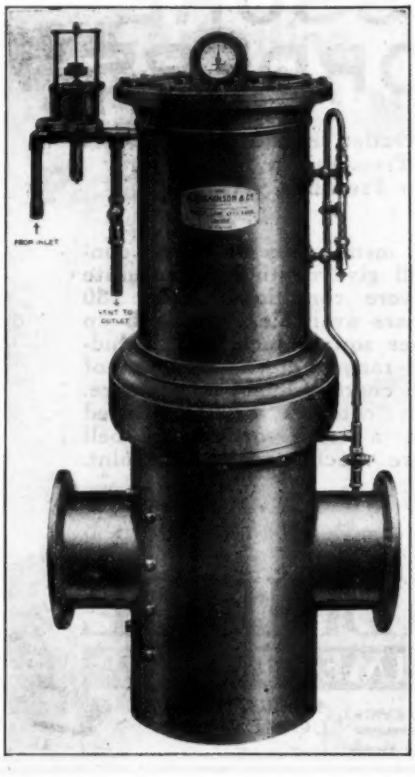

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